Elder Parent Health and the Migration Decision of Adult Children: Evidence from Rural China*

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Abstract

Recent research has shown that participation in migrant labor markets has led to substantial increases in income for families in rural China, yet we find that younger adults are much less likely to work as migrants when a parent is ill. Poor elder parent health has less impact on probability of employment as a migrant, however, when an adult child has other siblings who may be available to provide care. Our analyses make use of two complementary data sources: the first is a large household panel data set supplemented by an original follow-up survey that allows us to perform analyses robust to the potentially endogenous decision of whether an elderly parent resides with an adult child, or lives alone or with a spouse. Next we use four waves of the China Health and Nutrition Survey (CHNS), and make use of multiple measures of health status in panel data analyses. Our results suggest that improving or introducing pension and health insurance systems for rural residents in the developing world may be important not only for improving the welfare of the elderly, but also for easing constraints on the labor supply decisions of adult children.

JEL Codes: O12, O15, I12, J14

Key Words: Migration, Health, Aging, Rural China

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INTRODUCTION

With declining fertility and increasing life expectancy, countries across the developing world face the prospect of rapidly aging populations, combined with lagging or non-existent social safety nets. Nowhere is this more true than China, home to one-fifth of the world's elderly, where lack of pensions or health insurance for elderly in China's rural areas is particularly acute. Support for the elderly remains the responsibility of adult children, yet many observers have expressed concerns that the well-being of the rural elderly suffers as the population of potential caregivers continues to shrink with appearance of attractive migrant employment opportunities.[1] While under stress and perhaps insufficient to support retirement for healthy members of the elderly population, the traditional value of supporting elder parents in old age places restrictions on the labor supply decisions of adult children when elders require care. To the extent that adult children are responsible for providing care to elder parents, the lack of public social safety nets in rural areas places a burden on the young by restricting ability to earn higher incomes through participation in migrant labor markets.

In this paper, we examine the impact of elder parent health on the migration decision of adult children. Our theoretical framework assumes that adult children have altruistic preferences toward elder parents, and suggests that these preferences create incentives for children to provide time as care givers when elder parents are in poor health. In our empirical analyses, we find that presence of an ill parent, whether in the household or village, has a significant negative impact on the probability that an adult child will participate in the migrant labor market. If the extended family includes siblings, who are other potential care providers, the impact of elder parent health on the migration decision is much less pronounced. Our results suggest that failure to extend public social safety nets to rural residents may have an adverse effect on both the well-being of the elderly and the adult children making sacrifices to care for them.

The analyses of the paper makes use of two complementary data sources. First, we combine information from a unique household panel data source spanning the period from

[1] For example, recent research has found that the rural elderly in China enjoy little in the way of retirement (see Benjamin, Brandt and Fan, 2003; and Pang, de Brauw and Rozelle, 2004).

1986 to 2003 that is supplemented with a survey conducted by the authors in collaboration with researchers from the Research Center for Rural Economy (RCRE) at the Ministry of Agriculture. One advantage of the RCRE supplemental survey is that we have detailed information about parent mortality and sibling characteristics regardless of residence location, and this allows us to study the impact of parent health on participation in migrant labor markets while avoiding potential bias driven by endogenous family decisions regarding living arrangements of the elderly. The second data source used for our analyses are four rounds (1991, 1993, 1997 and 2000) of the China Health and Nutrition Survey (CHNS).[2] One important benefit of the CHNS lies in availability of repeat observations of multiple measures of health status that we are able to incorporate in panel data analyses robust to potential bias from unobserved household and village characteristics.

The paper proceeds as follows. We first provide background information on China's demographic transition, the living arrangements of the elderly, and the rural-urban migration experience. Next, we present the theoretical framework that motivates our empirical exercises, and then introduce empirical approaches. We next discuss results and robustness checks, and a final section concludes.

BACKGROUND

China's Demographic Transition and the Welfare of the Elderly

Successful efforts to limit fertility have contributed to the dramatic aging of China's population. Birth rates first started to fall with the "later, longer, fewer" campaign of the 1970s and then this decline became more dramatic with full implementation of the "one-child policy" after 1979. The results of fertility control policy are evident in Figure 1. By 2000, China's population pyramid was nearly diamond shaped, and in the next few decades it may well resemble an inverted pyramid.

[2]The CHNS is the product of collaboration between the Carolina Population Center at the University of North Carolina at Chapel Hill and the China Center for Disease Control and Prevention in Beijing. We discuss advantages and disadvantages of the CHNS for in more detail in our discussion of empirical approaches below. More information on this survey can be found at the Carolina Population Center, CHNS website: http://www.cpc.unc.edu/projects/china.

Decline in family size may ultimately have a negative impact on support received by the elderly, but conclusions drawn from research spanning literatures in demography and economics is not in agreement as to whether the demographic transition will lead to a breakdown of the traditional support system. Zimmer and Kwong (2003) show that more children increase the likelihood that elderly will receive support, but present simulation results suggesting that declines in fertility alone will not lead to collapse of family-based support for the elderly.[3] Other research has suggested that financial transfers to parents respond to low income and low health status in urban areas (Cai, Giles and Meng, 2005), and that in rural areas inter-household transfers are often not observed because they take the form of labor input into family farming (Lee and Xiao, 1998).[4]

In addition to social pressure, which may be brought to bear to enforce provision of support to elderly, the primacy of traditional support mechanisms was codified into China's laws from early in the history of the People's Republic. The Marriage Law of 1950 states that children should support elderly parents, and the Constitution of 1954 emphasized that children have a "duty" to support parents (see World Bank, 1994; and Fang, Wang and Song, 1992). The Marriage Law of 1980 further emphasized this responsibility, and provides elderly parents with the right to sue children for aliments if they fail to provide assistance.[5] The difficulty of enforcing family laws in China notwithstanding, these amendments to the marriage law and continued emphasis on using the law to maintain traditional family-based support reflects official determination to maintain the traditional system in the face of increasing pressures from demographic transition and attractive opportunities that have arisen with market reforms.

[3] This result is consistent with simulations based on data from the 1987 Aged Population Survey which suggested that in spite of declining fertility, the rural population will be able to support elderly parents (Lin 1994).

[4] Using other methods, Cameron and Cobb–Clark (2002) do not find evidence that transfers to parents respond to low parent income in Indonesia.

[5] The Chinese Marriage Law, Section 3, Article 21 states that "Parents shall be under the obligation for the upbringing and educating of their children, and children are also under obligation to support their parents.... Where any child fails to perform his or her obligations, parents who are unable to work or who are living a difficult life shall be entitled to ask their child to pay aliments (funds necessary to support basic housing and nourishment)." (*Author's translation* from 'Decision on Amending the Marriage Law of the People's Republic of China made at the 21st meeting of the Standing Committee of the Ninth National People's Congress', April 28, 2001).

In terms of understanding well-being of the elderly, most research has relied on indirect evidence suggested either by patterns of living arrangements or by labor supply and retirement decisions. Observed changes in living arrangements have been cited most frequently as reason for concern that the well-being of the elderly may be adversely affected by the demographic transition and the increase in off-farm opportunities.[6] The decline in co-residence with adult children is even evident over the four rounds, from 1991 to 2000, of the China Health and Nutrition Survey (CHNS). Figure 2 shows that in the CHNS, nearly 70 percent of adults in rural areas lived with an adult child in 1991, but by 2000 this share had fallen to around 60 percent. Similarly, the corresponding drop in urban areas was from roughly 60 percent in 1991 to just under 50 percent in 2000.

The change in living arrangements over both the long-run (from the 1930s to the 1990s as noted in Benjamin et al (2000)) and the short-run (from 1991 to 2000) does not necessarily reflect a drop in provision of care to elderly. In-kind transfers, transfers through provision of labor on extended family plots and transfers through provision of care are all very difficult to pick up in surveys, yet such transfers often occur both within and across households. In a study of elder support in Shanghai and Tianjin, for example, Bian et al (1998) found that non-resident sons and daughters frequently live near elderly parents and provide regular non-financial assistance to them. Changes in living arrangements reflect increasing wealth of families and with increasing resources, co-residence may not be necessary to provide care to the elderly. Within villages in rural areas, elders and adult children residing in the village are typically in the same small group (a sub-village administrative unit) and live in close proximity with one another. Given increases in housing wealth accumulated in rural areas since the mid-1980s, the trend toward nuclear families may well signal a wealth effect independent of the traditional value of providing support and care to elder parents. The more important concern may be the proximity of adult children, and not necessarily co-residence.

In Figure 3, we present lowess plots (locally weighted regression lines) that summarize

[6] Selden (1993) concludes that a transition to the nuclear family imposes a heavy price on the rural elderly. Benjamin, Brandt and Rozelle (2000) note that in Northern China over 85 percent of elderly lived in extended households in 1935, but that this figure had dropped to just over 60 percent by 1995. Living arrangements are thought to be important for elderly support across East Asia, including Cambodia (Zimmer and Kim, 2002), Thailand (Knodel and Debavalya, 1997), and Viet Nam (Anh et al, 1997).

living arrangement by age cohort from the supplemental RCRE survey conducted in 2004. This summary information shows that co-residence with adult children was only around 60 percent among elderly aged 60 to 70, but that more than half the elderly living alone or with a spouse in this age range had adult children living in the village, suggesting that while co-residence was well below levels of the 1930s, adult children were still residing in the same village and potentially available to provide care. As elder parent age increases, we see the probability of co-residence with an adult child approaches 100 percent.[7] In our first set of analyses on migration decisions, below, we make use of the existence of parents and their health status, regardless of presence in the household, to analyze the impact of parent health on migration behavior in models robust to the possibility that migration and the living arrangement of elderly parents are systematically related.

Analyses of the labor supply behavior of older adults have also been used to study the "retirement" behavior of China's rural residents. Agricultural production requires hard physical labor, and continued exacting labor into old age may lead to injury, raise possibility of developing health problems, or significantly reduce the well-being of older residents. Benjamin et al (2003) test the hypothesis that "retirement" patterns of elderly Chinese in rural areas can be characterized as a condition of "ceaseless toil" in which elderly must work their entire lives because they lack the resources to retire.[8] Collective ownership of land and collective production during their youth mean that current generations of elderly (and older middle-aged farmers) were unable to accumulate assets that could provide funds capable of facilitating retirement. Benjamin et al (2003) find that those rural residents with more wealth show steeper declines in days of labor supplied after age 55, suggesting that lack of tradable assets or liquid wealth may indeed limit the ability of elderly residents to retire.

Rural-Urban Migration in China

During the 1990s, China's labor market experienced a dramatic change with rapid growth

[7] Of course, two very different conclusions are consistent with evidence of greater incidence of co-residence with age in a simple cross-section: the oldest of the old, who are more likely to be infirm, tend to move in with adult children; alternatively, if co-residence does have an impact on level of care-giving, then perhaps only elderly living with adult children reach old age.

[8] The expression "ceaseless toil" was first coined by Deborah Davis-Friedman (1991) as a description of retirement patterns in pre-reform China.

in the volume of rural migrants moving to urban areas for employment. Estimates using the one percent sample from the 1990 and 2000 rounds of the Population Census and the 1995 one percent population survey show that the inter-county migrant population grew from just over 20 million in 1990 to 45 million in 1995 and 79 million by 2000 (Liang and Ma, 2004). Surveys conducted by the National Bureau of Statistics (NBS) and the Ministry of Agriculture include more detailed retrospective information on past short-term migration, and suggest even higher levels of labor migration than those reported in the census (Cai, Park and Zhao, 2004).

Before labor mobility restrictions were relaxed, households in remote regions of rural China faced low returns to local economic activity, raising the possibility that they were stuck in geographic poverty traps (Jalan and Ravallion, 2002). A considerable body of evidence suggests that the growth and scale of rural migrant flows in China make migrant opportunity an important mechanism for poverty reduction in China. Studies of the impact of migration on source communities demonstrate that opportunities to migrate are contributing to growth in rural incomes (Taylor, Rozelle and de Brauw, 2003; Wang and Zuo, 1997), easing problems of risk-coping and risk-management (Du, Park and Wang, 2004; Giles, 2005; Giles and Yoo, 2005), and possibly leading to higher levels of local investment in productive activities (Zhao, 2002).

With respect to well-being of the elderly, however, it is likely that the decision of adult children to participate in migrant labor markets places greater pressure on rural elderly to continue working. Given that rural households do not own the land that they farm, and that land transfer rights are still not well-defined in many regions, taking land out of production may lead to both lost income and risk that land will be transferred to another family. Thus, lack of a pension system for rural elderly is compounded by a system of land ownership that leaves elderly residents with few sources of non-labor income in their retirement. Furthermore, given the returns to migrant employment, it is likely that healthy farmers over 55 years of age, who lack the resources to retire, choose to continue work in agriculture in order to allow adult children to increase family income through employment outside the village.

Once elders become infirm, however, it is likely that adult children will find a way to provide some type of care. Often this will mean that at least one adult child will either return to the village, or decide not to participate in the migrant labor market. Anecdotal accounts are consistent with the likelihood that migrants face pressure to return to the countryside to fulfill obligations of providing care once parents are too ill to care for themselves.[9] The potential opportunity cost of caring for elder parents is clear, however, from descriptive evidence on conflict among siblings over decisions related to elder care. In 11 of the 55 RCRE villages from which household survey data are drawn for this paper, village leaders reported that disputes among siblings over elder care were either the first or second most important cause of conflict within the village.[10] As we will see below, the existence of siblings who might provide care reduces the impact of poor elder parent health on migration decisions, but it is likely that siblings "bargaining" over who will meet their traditional responsibility clearly recognize the opportunity costs of caring for parents.

In Figure 5, we summarize the migrant labor market participation of registered residents from RCRE households in 2003. A migrant has formal legal residence in an RCRE household, but is working and living outside the home county for more than six months of the year. Two characteristics of rural-urban migrants are evident in Figure 5: first, men participate in the migrant labor market at higher rates than women for any age cohort, and second, most migrants are relatively young. In our analyses below, we look at the migration decision of men and women separately, and concentrate our analyses on decisions made by individuals between 16 and 40 years of age.

THEORETICAL FRAMEWORK

Parent Health and Adult Child Utility

We assume adult children with altruistic preferences, such that utility of an adult child, U,

[9] Pang et al (2004), for example, cite an interview with a couple who stated that they had to return to their home village from higher wage jobs as migrants to care for an elderly parent.

[10] Conflict among siblings over care for the elderly was the third most important source of conflict in the 55 RCRE villages from which one of our data sources is drawn. This places conflict over elder care just behind disputes over land boundaries and over water rights, which are common across the developing world. The Chinese term we used for conflict in the survey, *jiufen*, implies a dispute significant enough to bring in police or other authorities from outside the village.

is a function of own consumption and the well-being of elderly parents, U^P, or

$$U\left(c, l, \mathbf{Z}, U^P\left(H^P\right)\right) \tag{1}$$

where c is a consumption good, l is leisure, $\mathbf{Z}$ are a vector of taste shifters.[11] Parent utility, in turn, is a function of own health, H^P, which can be represented by the health production function:

$$H^P = H\left(\alpha, h, t\left(t^c, t^s, t^o\right), I\right) \tag{2}$$

such that parent health is a function of time put into care, t, a health technology parameter, α, exogenous health status, h, and income transferred from children or other sources, I. Exogenous health status, h, will take on a value of one if, conditional on age, the parent is in good health and does not require assistance preparing food, maintaining a household, or performing other important activities of daily life. If the adult parent falls ill or is in bad health, exogenous health equals zero. We assume that time spent caring for an adult parent, t, could be provided by the adult child, t^c, by siblings, t^s, or by others, t^o. Controlling for the health technology parameter and income, we present our assumptions about the relationship between parent utility and care provided, t, in a "reduced form" representation shown in Figure 2. We normalize parent well-being for the case of exogenous good health to be $U(1, .) = 1$. When parent exogenous health is in the bad state, parent utility $U(0, t)$ increases from a minimum level, a, at a diminishing rate with increases in the amount of time spent providing care, t. Achievable parent utility when parent health is bad will not be as high as when exogenous health is good, but will converge to some level, $b < 1$, with increasing time spent on provision of care.

Adult children face a budget constraint (3) in which hired care provided to parents from siblings, at price P_s, and from others, at price P_o, plus income transferred to parents, and expenditures on consumption goods must equal income that could be earned either locally

[11] One could imagine more complicated models of parent utility that would allow for transfers and exchange of services between parents and adult children based on a mix of exchange and altruistic movites. For ease of exposition, we use a simple model in which the dimension of along which parent utility affects decision of adult children relates to well-being when ill.

or in the migrant market.

$$P_s t^s + P_o t^o + I^c + P_c c = P_a f\left(t^f, A\right) + \left(t^{loc} - t^c\right) w^{loc} \tag{3}$$

$$+ \left(t^{mig} w^{mig} - M\right) \left(t^{mig} w^{mig} \geq M\right)$$

Individuals have a fixed time endowment, T, such that

$$T = l + t^c + t^f + t^{loc} + t^{mig}$$

and make choices over consumption, c, income transfers to parents, I^c, and allocation of time to leisure, l, to providing care for elders, t^c, to farm production, t^f, to local wage employment, t^{loc}, and to employment in the migrant labor market, t^{mig}. Income from agricultural production is earned from selling an agricultural commodity at price P_a and produced with labor and land inputs, t^f and A, with a standard production function $f\left(t^f, A\right)$. The opportunity cost of providing care is valued at the local wage rate, w^{loc}, but the opportunity cost may be considerably higher if providing care makes it impossible for employment in the migrant labor market, at wage w^{mig}, to be of sufficient duration to compensate for fixed migration costs, M. In this case, the adult child will forgo employment in the migrant labor market all together.

Parent Health and Participation in the Migrant Labor Market

The adult child's decision can be represented in terms of indirect utility function of exogenous parameters:

$$V(P_s, P_o, P_c, w^*, h, \mathbf{Z}, \alpha) \tag{4}$$

The decision to migrate can be understood by looking at whether V increases or decreases with participation in the migrant labor market and how exogenous health status, h, and presence of siblings in the village may influence this decision. We treat w^* as the net wage (or returns) that may be earned through employment in the migrant market net of the costs

of migrating and the opportunity cost wages or farm profits in the home village.[12] We totally differentiate (4) and examine how utility will change with migration in each case.

Case 1: Elderly parent is healthy and the adult child has siblings ($h = 1,\ s > 0$). In this case,

$$dV^1 = \frac{\partial V}{\partial P_c}\partial P_c + \frac{\partial V}{\partial w^*}\partial w^* \tag{5}$$

change in utility with migration is influenced primarily by the higher prices of consumption goods in urban areas, and by the net increase in earnings available through migration. It should be straightforward to observe that $\frac{\partial V}{\partial P_c}\partial P_c < 0$ and $\frac{\partial V}{\partial w^*}\partial w^* > 0$ when expected wages are sufficiently high in urban areas. Since time spent providing care to elderly parents has no impact on parent utility when parents are healthy, $t^o = 0$ and $t^s = 0$, and the cost of hiring individuals to provide care does not enter into the potential migrant's decision.

Case 2: Elderly parent is ill and the adult child has siblings ($h = 0,\ s > 0$). Change in utility with migration will now be influenced by the "cost of hiring" siblings to care for the elderly parent, P_s.

$$dV^2 = \frac{\partial V}{\partial P_s}\partial P_s + \frac{\partial V}{\partial P_c}\partial P_c + \frac{\partial V}{\partial w^*}\partial w^* \tag{6}$$

In this case, we assume that $t^s \neq 0$ and $t^o = 0$ as sibling assistance in caring for elderly will cost less and be of higher quality than hiring a non-family member to provide care. Nonetheless, whether payment is in financial terms, in-kind, through the promise of unspecified future assistance, or extracted in some other way in the family relationship (e.g., through guilt), we assume that care provided by a sibling to an elder is not "free".

Case 3: Elderly parent is healthy and the adult child does not have siblings ($h = 1,\ s = 0$). As the elderly parent will not require care, change in utility from migrating will be identical

[12] Of course this net wage premium will not be directly observed, but will be determined by observables related to land holdings, family wealth and village characteristics that affect returns to local activity, and by human capital and other dimensions of ability that determine wages which an individual may earn in the migrant labor market.

to the change under Case 1, or

$$dV^3 = \frac{\partial V}{\partial P_c}\partial P_c + \frac{\partial V}{\partial w^*}\partial w^* \tag{7}$$

Case 4: Elderly parent is ill and the adult child does not have siblings ($h = 0$, $s = 0$). In this case, provision of care to the elderly parent will require hiring a non-family member if the adult child is employed as a migrant, so the change in indirect utility will be

$$dV^4 = \frac{\partial V}{\partial P_o}\partial P_o + \frac{\partial V}{\partial P_c}\partial P_c + \frac{\partial V}{\partial w^*}\partial w^* \tag{8}$$

Hiring someone other than a family member will be costly, and in some cases the cost will be so high that we do not observe such transactions.

Making the reasonable assumption that $\frac{\partial V}{\partial P_o}\partial P_o < \frac{\partial V}{\partial P_s}\partial P_s < 0$ leads us to conclude that $dV^4 < dV^2 < dV^1, dV^3$, or, that participating in the migrant labor market will look less attractive if the individual has an elderly parent who is not in good health. Further, if the individual has no siblings available to act as potential caregivers, then choosing to participate in the migrant labor market will be even less attractive when an elder is in poor health.

EMPIRICAL APPROACHES

As outlined in the theoretical framework above, we expect to find that migration patterns will differ with the health status of parents. To estimate the impact of parent health on the migration decision of individual i in time t, one might choose a reduced form binary choice model:

$$MIG_{it} = \alpha H_{it}^P + \mathbf{Z}'_{it}\beta_1 + \mathbf{X}'_{it}\beta_2 + \mathbf{V}_j + \mathbf{Y}_{p\bullet t} + \mathbf{u}_i + \epsilon_{it} \tag{9}$$

where MIG_{it} is a binary variable equal to one if individual i participates in the migrant labor market in year t, H_{it}^P is the health status of a parent (or parents) of individual i, $\mathbf{Z}_{it}$ and $\mathbf{X}_{it}$ are vectors of household and individual characteristics, respectively, that affect individual i's preferences or ability to participate in the migrant market. Characteristics such as individual ability and educational attainment, included among the $\mathbf{Z}$ in models (1)

and (4), influence the attractiveness of migrant employment through their impact on the potential wage premium over local employment that an individual might be able to earn as a migrant, as well as preferences for participation in the migrant market. Village fixed effects, $\mathbf{V}_j$, control for proximity to cities and other fixed factors that likely influence the cost of migrating. A vector of province-year dummy variables, $\mathbf{Y}_{p\bullet t}$, pick up macroeconomic factors that affect demand for labor in potential migrant destinations and temporary differences in the legal ease of migrating. Next, one might worry about unobservable factors, $\mathbf{u}_i$, that influence the migration decision, and an error term.

The objective of our analysis is to arrive at an unbiased estimate of α, which picks up the impact parent health on the migration decision. From this specification, it is clear that four potential problems should concern us: simultaneity bias, omitted variable bias, bias due to error in the measurement of parent health status, and selection of elderly into the household. With respect to simultaneity bias, some household and individual characteristics, $\mathbf{Z}_{it}$ and $\mathbf{X}_{it}$, may reflect decisions made jointly with the migration decision, MIG_{it}. Solutions to this problem require care in choice of covariates, and as an extra precaution, use of covariates that are, at the least, predetermined at time t. Thus, one might consider regressing the period t decision on period $t-1$ household and individual characteristics, or:

$$MIG_{it} = \alpha H^P_{it-1} + \mathbf{Z}'_{it-1}\beta_1 + \mathbf{X}'_{it-1}\beta_2 + \mathbf{V}_j + \mathbf{Y}_{p\bullet t} + \mathbf{u}_i + \epsilon_{it} \tag{10}$$

Unobservable factors potentially correlated with observations of parent health and the migration decision pose a more serious problem, and using predetermined household characteristics alone will not solve these problems. Several sources of bias may be present if we estimate (10) using pooled cross sections from typical household survey data. First, ability to observe elder parent health reflects a potentially endogenous decision of the household and family: the elder parent's presence in the household, for example, may reflect a decision to "employ" a grandparent as a provider of child-rearing services to the adult child's family. This unobserved decision behind selection of the elderly person into the household may facilitate participation in migrant labor markets and will be systematically related to the

adult child's migration decision. Alternatively, the adult child may be living in a parent's household because he, or she, has not yet married and established a family, or may not have saved sufficient resources to set up a separate household. In this case, the migration and co-residence decision may be systematically related to credit constraints faced by the adult child, which may be related to ability to migrate. Finally, an elder parent's residence in the household may reflect the outcome of a bargaining process among siblings, with the household choosing to care for an ill parent making an implicit decision to reduce participation in the migrant labor market.

Omitted variable bias may be serious if the adult child's non-resident siblings are unobserved. We know from (4) and (6) that the "price" of hiring a sibling to care for elder parents may be important for understanding the migration decision. When using typical household survey data, the researcher does not have information about siblings, or children, who are not residing in the household. Number of siblings, who are either potential caregivers or potential recipients of parent labor, will be systematically related to whether or not we observe an elder parent living in the household. Further, number of siblings may be systematically related to the decision to migrate because larger extended families have more funds available to finance a new migrant. Alternatively, larger extended families may be engaged in more extensive family business activities in which an adult child could find local employment. We cannot sign the bias *a priori*, but such unobservables related to the extended family will be correlated with both the living arrangement decision that brings an elderly person into the household, and the decision to participate in migrant labor markets.

Finally, from a typical household survey it is not certain that we know whether parents are still alive if they do not live in the household, and if they are, we may not be able to come up with a proxy for parent health status. Given that declines in co-residence with adult children may reflect increased wealth and be independent of changes in support provided to parents, we may underestimate the impact of parent health on migration if we do not have information on non-resident parents.

We use two approaches to dealing with these unobservables. First, we make use of a unique survey that will allow us to include what would normally be omitted variables related

to parents and extended family members who are not residing in the household. Second, we estimate first-differenced models that sweep out unobserved effects using four waves of the China Health and Nutrition Survey (CHNS). Both of these approaches take us a long way toward solving biases related to unobserved heterogeneity, and each approach will have both strengths and weaknesses. Below, we outline identification strategies and discuss the data source used for each approach, before presenting and discussing results in the following section.

Identification Using the Research Center for Rural Economy (RCRE) Supplemental and Household Surveys

The first set of analyses that we present use supplemental survey data collected through collaboration with researchers at the Research Center for Rural Economy (RCRE) at China's Ministry of Agriculture. All 3999 households in four provinces of the most recent wave of RCRE's panel were enumerated, allowing us to match villages and households from the 2004 supplemental survey with a historical panel of villages and households that RCRE has surveyed annually from 1986 to 2003.[13] The supplemental survey has several unique features that will be important for our analyses. First, we know the education level, birth year, current occupations, work and migration history, parent and sibling characteristics and residence locations for the household head, spouse and all adult children of households in the survey. Furthermore, we know geographic location of parents and siblings for all individuals as of 2003, and the year of death of parents and siblings who have passed away through October 2004. These data allow us to estimate a version of (10) in which parents, parent health and sibling information are introduced at the level of the family, not the household. Extensive parent and sibling information allow us to estimate the impact of parent health on migration independent of factors affecting parent and sibling selection into the household.

[13] A detailed discussion of a larger nine-province sample from the RCRE panel dataset, including discussions of survey protocol, sampling, attrition, and comparisons with other data sources from rural China, can be found in the data appendix of Benjamin, Brandt and Giles (2005). This paper makes use of village and household data from the four provinces where the authors conducted a follow-up household survey, and include Anhui, Henan, Jiangsu and Shanxi.

We estimate:

$$MIG_{it} = \mathbf{H}^{P\prime}_{it-1}\alpha_1 + \left(s_{it-1} \cdot \mathbf{H}^{P}_{it-1}\right)' \alpha_2 + \alpha_3 PAR_{it-1} + \alpha_4 s_{it-1} + \mathbf{Z}'_{it-1}\beta_1 \qquad (11)$$

$$+ \mathbf{X}'_{it-1}\beta_2 + \mathbf{V}_j + \mathbf{Y}_{p\cdot t} + \mathbf{u}_i + \epsilon_{it}$$

Our dependent variable in (11) takes a one if an adult child, head or spouse decides to participate in the migrant labor market during year t. We look exclusively at individuals who leave the household and move to a location outside of the home county for the purpose of employment. Migrants include both individuals who may commute back to the household on weekends, and individuals who spend nearly the entire year away from the household. $\mathbf{H}^{P}_{it-1}$ are indicators for parent health status, s_{it-1} is the number of siblings alive, and PAR_{it-1} is the number of parents still alive at $t-1$. All three of these variables are at the family level and are measured independent of residence in the household. The coefficient vector α_1 picks up the effect of parent health, regardless of parent location, on the adult child migration decision and we expect that poor health will be associated with a lower probability of participating in the migrant labor market. Availability of siblings will lower the cost of hiring care for ill parents, and thus we would expect the coefficient vector α_2 to carry a sign opposite the sign of α_1 reflecting a reduction in the effect of parent illness with an increase in number of siblings.

We also control for number of living siblings and parents, regardless of residence in the household, and we remain agnostic as to the effect of these variables on ability to migrate. More living parents may imply that the adult child has access to low-cost child care and thus facilitate migration, or alternatively, the adult child may have responsibilities other than providing care, such as provision of labor input on land controlled by the parent, that may reduce likelihood of participation in migrant labor markets. Similarly, the direct effect of additional siblings is difficult to sign *a priori.* Additional siblings may have a direct positive impact on migration if the larger family network relaxes credit constraints that limit ability to participate in the migrant market. Alternatively, more siblings might raise

the possibility of employment in some type of local entrepreneurial activity operated by a relative or through referral of a relative. In this case, an additional sibling may reduce the likelihood of working as a migrant. Descriptive information on sibling and parent variables, as well as other regressors discussed below, can be found in Appendix Table A.1.

Parent health status: subsequent mortality. We use information on parent subsequent mortality as our measure of parent's current health status. Death is often preceded by a considerable period of illness or infirmity in which an individual is unable to work and may require care.[14] We use three indicators to examine the relationship between parent health and migration in period t: *parent died in year* t, *year* $t+1$ and *year* $t+2$, respectively.[15] The benefit of parent subsequent mortality as an indicator is that it is particularly salient in the minds of respondents regardless of whether or not the parent resided in the household, and thus it is straightforward to ask individuals to report the year that each parent died in a retrospective follow-up survey. Figures 6 and 7 show lowess plots summarizing the bivariate relationship between migration rate and age separately by subsequent parent mortality. For adult cohorts over age 25, parent death one year and two years in the future is associated with lower migration rates for both men and women. For younger cohorts, the number of individuals experiencing parent death is lower, and so the lowess plots for young cohorts with future parent death are measured with considerable error. Moreover, parents of younger cohorts will themselves be younger, so that parent mortality experiences for younger adults are more likely to have been surprise shocks and not been preceded by lengthy periods of illness.

Individual characteristics. We include in our models several characteristics intended to pick up heterogeneity across individuals in the returns that can be earned locally and in the migrant labor market. Individual educational attainment in the year prior to the decision to participate in the migrant labor market is included as a measure of potential

[14] Early research on retirement behavior in the US favored subsequent mortality experience over self-reported health status as a health status indicator. See, for example, Anderson and Burkhauser (1985), Hurd and Boskin (1984) and Parsons (1980).

[15] We experimented with longer leads of parent mortality experience, but find that effects are not significant for leads greater than two and, from a practical estimation standpoint, longer leads require that we lose more observations.

human capital. Educational attainment is reported in two variables: completion of middle school (eight years of formal education in villages with five year elementary schools and nine years of formal education in villages with six year elementary schools) and completion of high school (eleven or twelve years of education depending on duration of elementary education in the area). Educational attainment of parents (completion of middle school and high school) is included to control for dimensions of observed ability, and for family preferences regarding enrollment in high school and occupational choice. Finally, age and age-squared are included to control for life-cycle effects that may influence the decision to participate in the migrant labor market.

Household characteristics. We merge two variables from annual rounds of the RCRE panel household survey on to the supplemental survey and use them to control for the attractiveness and ability to participate in the migrant labor market. Lagged household land per capita controls for factors affecting the marginal productivity of additional labor used in farming, and by implication, differences across households in the premium that may be earned in the migrant market. We include the lag of log household consumption per capita as a control for household wealth, which influences both ability and desirability of participating in the migrant market. Finally, from retrospective information in the RCRE Supplemental survey on past members of the household, we include a vector of household demographic characteristics. The vector of household demographic characteristics (shown in Appendix Table A.1) excludes elderly parents and siblings whose information we employ in our models at the family (not household) level.

The error term. After we control for characteristics of parents and siblings regardless of residence, we assume that there are no other important omitted variables correlated with parent health and the migration decision that could bias our results. At first blush, it might appear appropriate to control for remaining unobservables using a first-differenced specification. If we did so, we would lose interesting information on the impact of siblings, which vary little in the panel. Further, much of the data used in our analyses comes from retrospective information in the supplemental survey. While we construct the data source

used in our estimation in panel form, a first-differenced implementation does not have the same interpretation as in typical first-differenced panel data models because all variables in the supplemental survey are measured at one period in time. We thus present cross-section results that include (normally omitted) variables related to siblings and parents, and that are robust to selection of elder parents or siblings into the household. Finally, it is important to note that using lags of household and individual characteristics and leads of mortality experience may introduce serial correlation in our error term. For this reason, all models presented include standard errors robust to heteroskedasticity and serial correlation within the household.

The sample. A detailed breakdown by family relationship of the sample used in our estimation is shown in Table 1. We have complete information over time on the parents and siblings for the household head, spouse of head and each adult child who lived in the household since 1993, but lack complete information on siblings and parents of the non-resident spouse of migrant adult children. This means that we will not observe some spouses of adult children in our analyses, and for this reason, we have more observations on men than women: this occurs because it is traditional, and far more common, for women to move into the household of their husbands upon marriage. For this reason, we might also expect to see stronger effects of parent illness and siblings on migration decisions of men than women. Own parent health may not be as important for determining migration behavior of women as the health of her spouse's parent and number of spouse's siblings. We do not have a clean way of estimating these effects, however, because own parent health is still likely to be important for women who are unmarried. Moreover, we do not have complete information on the parents and siblings of the spouse of adult children (see Table 1), and thus suffer from small sample sizes if we attempt to study these effects on migration by using only a selection of spouses of the household head. We thus show results that look at the effects of own parent health on migration behavior of men and women separately.

Identification Using the China Health and Nutrition Survey (CHNS)

Measures of Health Status. One benefit of the CHNS is that we have repeat observations

on different measures of health status, and this is particularly valuable for the difficult task of studying the effects of elder parent health. At the same time, survey data on health status are not always straightforward to use in econometric estimation. Health is multi-dimensional and measures of health in socioeconomic surveys each isolate only a few dimensions of health status. Moreover, health measures are often reported with considerable error, and worse, the respondent's socioeconomic status or beliefs may be correlated with use of health facilities or access to information about health, and thus lead to considerable bias in reporting of health outcomes. Below, we first briefly review the measures of health status from the CHNS that we use in our analyses, and discuss particular concerns with each measure that must be dealt with in order to credibly identify the impact of elderly health on migration decisions.[16]

Self-Reported Health Status (SRHS and $H34$) is viewed by some to be the best composite indicator of health because SRHS performs well as a predictor of subsequent mortality.[17] On the other hand, SRHS is subject to several important sources of bias that may be systematically related to labor supply, to household socioeconomic status and to family decisions about activities such as participation in migrant employment. Bias may arise because "good" health may not mean the same thing to all people. Perceptions of one's health, or of a household member's health, may be related to values, beliefs and information, all of which may be related to socioeconomic characteristics or concurrent or prior use of health care facilities.[18] Further, justification bias may arise if an individual's decision about participation in the labor market is related to feelings about own health or the health of an elderly parent. Finally, measurement error bias may arise because SRHS is typically measured on a discrete scale and only imperfectly captures fine gradations in health status. Baker, Stabile and Deri (2004) suggest that measurement error bias is far more important than justification bias in self-reported health measures.

[16] A more detailed discussion of these measures in the developing country context can be found in Strauss and Thomas (1998). In Appendix Table A.2 we provide summary statistics of important CHNS variables used in our analyses.

[17] Benjamin et al (2003) demonstrate that self-reported health status does a good job of predicting subsequent mortality in the CHNS data used in this paper.

[18] Research from the RAND Health Insurance Experiment suggests that while health may improve with use of health facilities, self-reported health status may actually decline as those expanding utilization of health care facilities receive more accurate information about actual health status (Newhouse et al, 1993).

The CHNS question on SRHS asks respondents to rate their health relative to other people their age, and then responses are coded on a scale of one (excellent) to four (poor). When we make use of this variable below, we transform SRHS into a discrete indicator of poor health, $H34$, which equals one when a respondent reports fair (three) or poor (four) health. In models of the migration decision, we analyze the presence an elder ill person (one or more elderly residents with $H34$ equal to one) on the migration behavior of younger family members, and include also own $H34$ in models that control for own health status of potential migrants.

Self-Reported Morbidity (SRM) refers to specific episodes of illness and is often viewed as an improvement over SRHS because it is more precise, and in the CHNS and other surveys SRM can be broken into a number of measures as questions are asked about specific diseases. However, SRM is a self-assessment and ultimately suffers from the same types of bias as SRHS. In the case of the CHNS, information on general morbidity is fairly complete, but with respect to specific illnesses, we judged that there were too many missing values to make use of specific disease information in this research.

The CHNS general morbidity question asks respondents if they were sick or injured during the previous four weeks, and then, if the answer is yes, asks them to rate the severity of their illness. We code SRM as equal to one if a person was ill and the illness was rated as severe or somewhat severe. We will use differences in this measure as instruments for differences in own self-reported health status in our analyses below.

Body Mass Index (BMI) is the ratio of weight (in kilograms) to height (in meters) squared and provides an anthropometric measure of physical health. Extremely low and high BMI are each associated with higher adult mortality. Figure 8 shows the relationship between BMI and self-reported health status for elderly adults in the CHNS. High levels of SRHS are associated with poor health in the CHNS, and we see a familiar $U-$shaped curve in which low BMI is associated with lower health status, and health status appears to worsen, albeit slowly, as BMI increases beyond 30.[19] Since BMI has an important relationship to

[19]Costa (1996) shows a similar plot of the relationship between BMI and self-reported health in her historical study of older male labor force participation.

SRHS and to labor supply decisions when very high or very low, we follow Benjamin et al (2003) and use it to construct two discrete measures: High BMI and Low BMI, which equal one when an individual's BMI is in the highest or lowest 20 percent of the annual BMI distribution, respectively.

Empirical Approaches Using the CHNS

In order to achieve robust and consistent estimates of the effect of elder health on migration behavior in equation (10) above, we must control for omitted variable bias and measurement error bias. Given that we would like to use a single composite measure of health – presence of elderly resident with poor health ($H34 = 1$) – has distinct advantages, but a serious disadvantage remains in that it will be related to socioeconomic status, culture and preferences that will be unobserved, but are likely to be correlated with family-specific benchmarks for judging health status. Under the assumption that these unobservables are not changing much between two time periods, we estimate the model in first-differences to sweep out effects of these unobservables.[20] The dependent variable is equal to one if an individual migrated out of the household between periods $t-1$ and t, zero if no migration occurred and negative one if a family member moved back to the household.[21] Thus, we estimate:

$$\Delta MIG_{it} = \alpha \Delta H^{E}_{it-1} + \Delta \mathbf{Z}'_{it-1}\beta_1 + \Delta \mathbf{X}'_{it-1}\beta_2 + \mathbf{Y}_{p\bullet t} + \upsilon_{it} \tag{12}$$

where ΔH^{E}_{it-1} is the change in incidence of an elderly household member reporting fair or poor health ($H34$), $\Delta \mathbf{Z}_{it-1}$ and $\Delta \mathbf{X}_{it-1}$ are changes in household and individual characteristics between $t-2$ and $t-1$, and $\mathbf{Y}_{p\bullet t}$ are province-year dummy variables that control for provincial macroeconomic growth effects.

While first-differencing solves problems created by omitted variable bias, measurement error bias in the differenced ΔH^{E}_{it-1} will lead to attenuation of α. We use change in lag

[20] We believe this to be reasonable because there has been stagnation in provision of health care in China's rural areas over this period so families are unlikely to be learning more about what constitutes good health status, and long-term family socioeconomic conditions are not typically changing enough between survey rounds to warrant much concern.

[21] If an individual who was in a previous round of the CHNS is not in the current round of the survey, a question is asked regarding the location of this individual. We consider any individual who has left the home county between period t and $t-1$ to be a migrant.

shares of elderly with high and low BMI as instruments for ΔH^E_{it-1} to correct for classical measurement error bias.

An additional problem arises in (12) if change in own health status is correlated with changes in health status of elderly residents. This might happen if a wealth shock affecting the family led to a decline in nutritional status of all household members, or if the entire family developed similar illnesses as might occur from exposure to toxins or some other pollutant in the local environment. In order to control as well for own health status, we also estimate

$$\Delta MIG_{it} = \alpha_1 \Delta H^E_{it-1} + \alpha_2 \Delta H^i_{it-1} + \Delta \text{Low} BMI^i_{it-1} + \Delta \text{High} BMI^i_{it-1} \tag{13}$$

$$+ \Delta \mathbf{Z}'_{it-1}\beta_1 + \Delta \mathbf{X}'_{it-1}\beta_2 + \mathbf{Y}_{pxt} + \upsilon_{it}$$

where $\Delta H^i_{it-1}$is the lag change in own self-reported health status ($H34$), and we include indicators for change in own low and high BMI directly in the model. To correct for measurement error bias in ΔH^i_{it-1} we introduce two additional instruments: change in self-reported morbidity (ΔSRM_{it-1}) and change in difference between high and low BMI among adult residents of the household standardized by household average BMI, or

$$\Delta D_{it-1} = \left[(BMI^{\max}_{it-1} - BMI^{\min}_{it-1})/BMI^{avg}_{it-1}\right] - \left[(BMI^{\max}_{it-2} - BMI^{\min}_{it-2})/BMI^{avg}_{it-2}\right]$$

The range of the difference in BMI will pick up additional information on illness within the household, and we normalize this difference by average BMI to control for common genetic features of family members. Once controlling for health status of potential migrants between 16 and 40, we can be comfortable that the coefficient on ΔH^E_{it-1} reflects the impact of elderly health status on young adult migration decisions.

We use an instrumental variables generalized method of moments (IV-GMM) estimator to obtain efficient estimates of (11) while allowing for heteroskedasticity and arbitrary correlation within households. To test for over-identification we use the Hansen J-Statistic,

which is similar to the more well known Sargan Over-Id test but is valid in the presence of heteroskedasticity.

While specifications using the CHNS have appeal because we can use direct observations on health and difference out important unobservables and related bias in self-reported health measures, we cannot adequately control for selection of elderly into households. Results using the RCRE data source will be robust to selection of elderly into households, and thus allow us to control for important unobservables related to family structure that are likely to be systematically related both to the migrant employment decision and to provision of elder care. At the same time, other sources of heterogeneity are not differenced out of these models. For this reason, we view results obtained using the RCRE household and supplemental surveys as complementary to those produced using the CHNS. The fact that we obtain consistent results across analyses using these two data sources provides comfort that our results are not driven by selection, in the case of CHNS-based models, or some other unobservable, in the case of RCRE-based analyses.

RESULTS

Estimates Using the RCRE Supplemental and Household Surveys

To assess the extent and direction of bias that may be introduced when using observed information on household members alone, we first estimate (10) excluding information on parents and siblings not living in households. Results for this specification are shown for men in columns (1) and (2) of Table 2 and in columns (5) and (6) for women. We observe negative coefficients of -0.049, -0.066 and -0.08 on indicators of parent death in years t, $t+1$ and year $t+2$, respectively, suggesting that when information on parents outside the household is excluded we will observe a negative relationship between parent health and probability that male adult children will be employed as migrants. We observe a negative coefficient on number of parents alive (and living in the household) and positive coefficients on number of siblings (also living in the household). Parents living in the household may be associated with care or other forms of economic assistance provided by adult children that dominate potential elder role in child care. The positive coefficient on siblings in the household likely

reflects an endogenous decision to maintain a larger household capable of diversifying across a range of activities, one of which may include participation in the migrant labor market.

Models with interaction of siblings and elder parent health variables do not yield statistically significant coefficients. Coefficients on parent health (subsequent death variables) do not differ significantly from those in the model without interactions, while coefficients on interactions with siblings do not suggest that the presence of siblings provide substitutes in care giving that facilitate migration. Finally, we observe no significant effects of parent health on the migration behavior of women.

Inclusion of information on siblings and parents regardless of residence in the household suggests that observing only household residents may indeed introduce significant bias. We show results from our preferred models that include extended family information for men in columns (3) and (4) of Table 2, and in columns (7) and (8) for women. The full model for men, shown in column (4), suggests a stronger negative impact of parent illness on the migration behavior of men than when information on non-resident parents and siblings is excluded. Excluding both existence of parents and information on parent health status leads to underestimation of the effects of elder illness on migration decisions of individuals with few siblings. We find a significant 12 to 16 percent decrease in the probability of migrating when a parent is ill and the adult child has no siblings. The significant parent health-sibling interaction terms suggest that existence of siblings who may be available to provide care will reduce the negative effects of elder parent illness on ability to migrate by two to three percent per sibling. These results indicate that effects of parent health on migration behavior will be under-appreciated if we fail to consider the existence of sick parents not residing in the household, and further, are consistent with adult children whose labor supply decisions are responsive to parent illness regardless of whether or not parents reside in the household.

It is also interesting to note that the effect of siblings on migration switches from positive and significant to negative and significant once we consider number of siblings regardless of membership in the household. Presence of siblings may indeed be related to an endogenous decision to maintain a larger more diversified household.[22] The negative relationship between

[22] Alternatively, siblings may be more likely to reside in the household when both the individual and

number of siblings and migration in family-level regressions suggests that size of the local family network may be systematically related to local opportunities and dominate the effects of family size on ability to participate in the migrant labor market.

A final curiosity rests with differences in the association between high school completion and migration for men and women, and this difference could be driven by they differences in types of migrant employment available to men and women, or by sampling effects that leave out spouses of migrating adult children. It is important to recall that we only observe women who are spouses or adult children living in the household after 1993, and miss information on women who may have married out of households prior to 1993 or who are married to migrant male adult children. Male adult children with higher education may be more likely to migrate out, and we observe information about them, but we do not observe the educational attainment of their spouses. Given that individuals of similar educational attainment typically marry, this difference in coefficients may be driven by the fact that we systematically miss female high school graduates who are migrating with male spouses.

Estimates Using the CHNS

The first stage. In Table 3 we present results of first-stage regressions of change in presence of an ill elderly resident on instruments and second stage regressors. Change in share of elderly within the household who have low and high BMI, respectively, are sufficiently significant to function as instruments for change in presence of an elderly resident with poor health. F-statistics on these two variables are 20.3 for men and 4.9 for women with F-probabilities below one percent. The model also controls for changes in household structure between $t-2$ and $t-1$ and this is important because presence of elderly members who are ill will change mechanically if elder parents move into or out of the household.

The impact of elder health on the migration decision. Once we first-difference, to sweep out bias in self-assessments and correlated unobservables, and instrument to control for classical measurement error bias, we find that health of elderly household members has a

the sibling are young. In this case, a resident sibling may also be a source of information about migrant opportunities and thus lead to a positive association.

significant negative impact on the migration decision of rural men. Table 4 presents results of OLS, first-differenced and first-differenced IV models of determinants estimated separately for men and for women between 16 and 40. In a household with an elderly member, a man between 16 and 40 will be 20.7 percent less likely to participate in the migrant labor market in period t if the elderly person became ill between $t-2$ and $t-1$. As with the RCRE-based estimates, we do not observe a similar, statistically significant effect on the migration decision of women.

Elder parent health may be correlated with own health status, and thus one should be concerned that the negative impact of elder parent health on migration may actually reflect declines in own health that are correlated with declines in elderly health. While we pass an over-identification test in the model for men, we just barely pass, and this may indicate that there is another unobservable that is somewhat correlated with our instruments and with migration. Own health is a likely candidate for an important omitted variable.

Robustness to own health status. In order to control for own health status, we include three additional variables. Own Low BMI and High BMI dummy variables are included as direct controls for health, and in addition, we include own self-reported health status. In Table 5 we show first-stage results for change in share of elderly in poor health and change in incidence of own poor health. We use four instruments, and for both men and women F-statistics are sufficient for identification. For men, we see that in addition to marginal significance of change in share of elderly with high BMI on change in elderly with poor health, we also observe correlations of elderly health with change in own self-reported morbidity and change in the standardized BMI difference within the household. Further, in the change of own health status regression, change in share of elderly with low BMI is significant as is the change in standardized BMI difference. Health measures drawn from within the household will be correlated with one another, and so this is not entirely surprising. It is important that we a sufficient number of distinct instruments to identify both change in presence of ill elderly member and change in own health status.

We find that inclusion of the potential migrant's health status leads to increases in the magnitude of the negative effects of an ill elderly household member for both men and women

(the effect of poor elder health on women is still insignificant). Further, once we include measures of individual health status, our preferred models are comfortably over-identified.

In terms of understanding the importance of possible selection effects, reflection on the RCRE-based results suggests that selection of elderly into the household in our CHNS-based estimates is not necessarily leading us to overestimate the negative effect of poor elder parent health on the migration behavior of younger adults. Indeed, our exercise with models excluding and including extended family members with the RCRE data suggest that omitted information on both elder parents and siblings not residing in the household may lead us to underestimate parent health effects on migration decisions.

Finally, it is notable that in common with the RCRE estimates, we also observe a positive and statistically significant relationship between high school completion and migration for men, but not for women.[23] The similarity across the two data sources in differences in coefficients on educational attainment suggests that men and women may indeed migrate to engage in activities requiring different levels of skill.

CONCLUSIONS

Using two different data sources and complementary estimation strategies, we find that ill health of elder parents reduces the probability that individuals will participate in the migrant labor market. Our findings have significant implications for our understanding of how well traditional support mechanisms are functioning and for potential benefits of improved safety nets in rural areas. First, while likely that both the demographic transition and new labor market opportunities are putting traditional family-based support mechanisms under considerable strain, it appears that young rural adults continue to respond to traditional responsibilities. Changes in living arrangements do not necessarily indicate a decline in willingness to care for parents, and this is evident in a stronger adult child response to parent illness when we include information on health status of non-resident parents.

Second, in the absence of a social safety net, infirmity of the elderly may restrict the income earning choices of adult children. To be sure, the absence of children from the village

[23] Note that in the the first-differenced estimates, high school and middle school attainment effects are driven by younger individuals in our sample frame who completed school these respective levels after age 16.

before illness and elderly supply of labor to agricultural production after age 60 may hasten the deterioration in health that leads to infirmity. Lack of pensions, lack of insurance for health treatment and lack of accumulated assets, all of which restrict the ability of elderly to retire, are plausibly related to earlier onset of parent illness that may force adult children to forgo income earning opportunities in urban areas. As stressed elsewhere (e.g. Benjamin et al, 2000; and Benjamin et al 2003), improved safety nets and secure tradable property rights over land may have significant beneficial effects for elderly welfare in China's rural areas, but these benefits are not restricted to the elderly alone. Even if some observers may judge support from children to be too little too late, evidence presented in this paper on elderly health and participation in migrant labor markets suggests that young adults do not completely abandon their traditional obligations to support parents. Thus we conclude that lack of pension support and health insurance for elderly in rural areas may lead to costly restrictions on the labor allocation decisions of their adult children.

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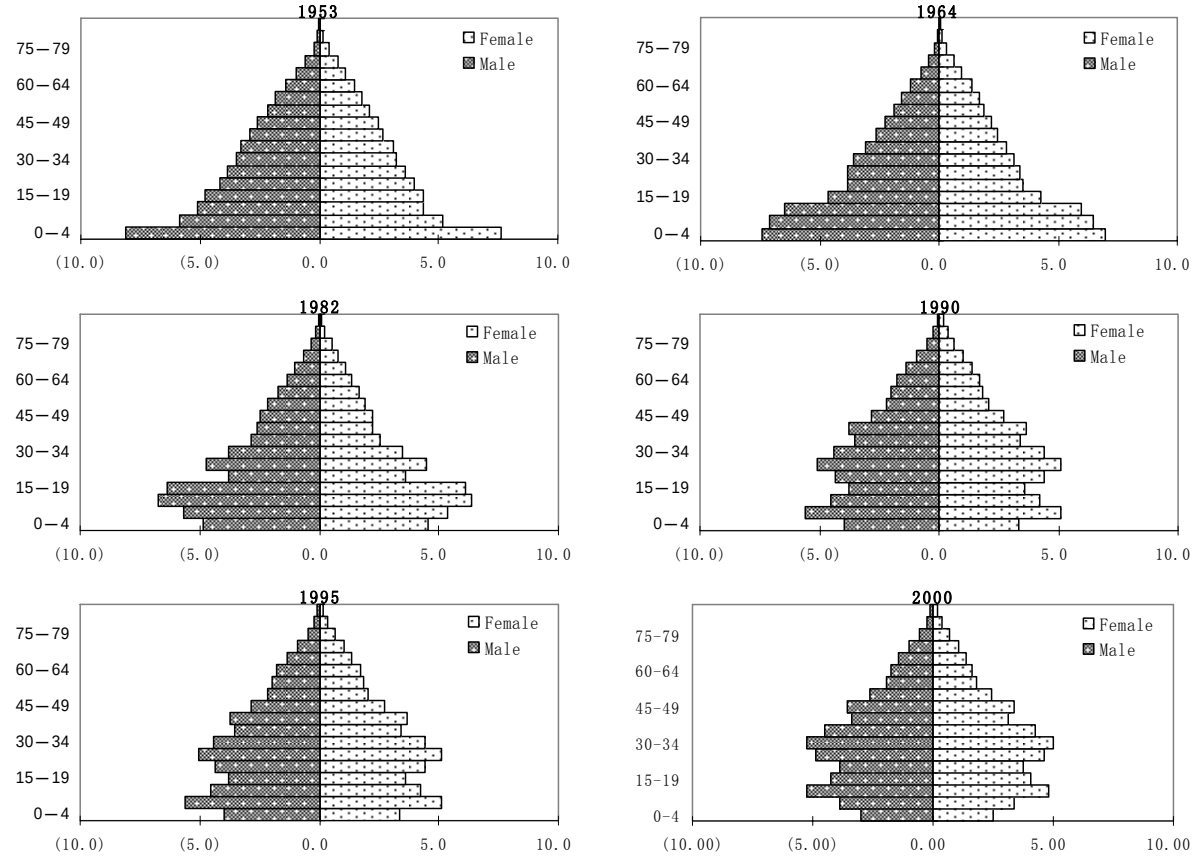
Figure 1. The Evolution of China's Population Pyramid Over Time



Notes: Source data is from China Population Census, and 1 Percent Population Census (Various Years). Each bar shows the percentage of the total population represented by the demographic group represented.

Figure 2. Care Provided and Elderly Well-Being

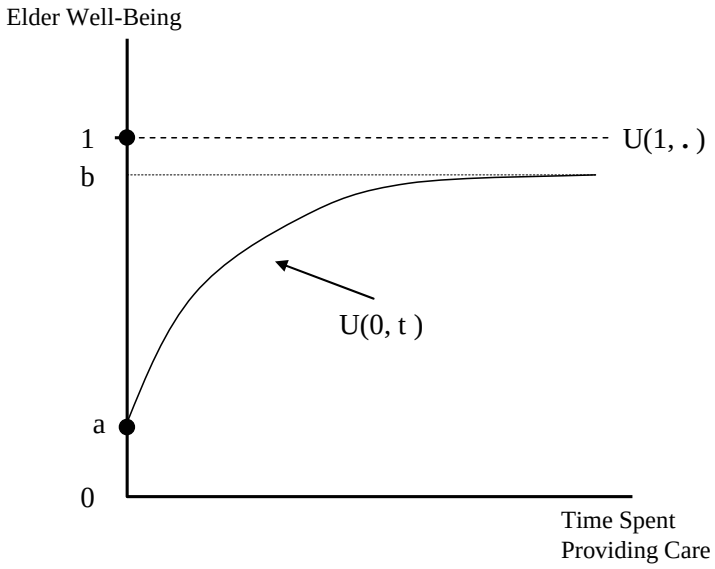
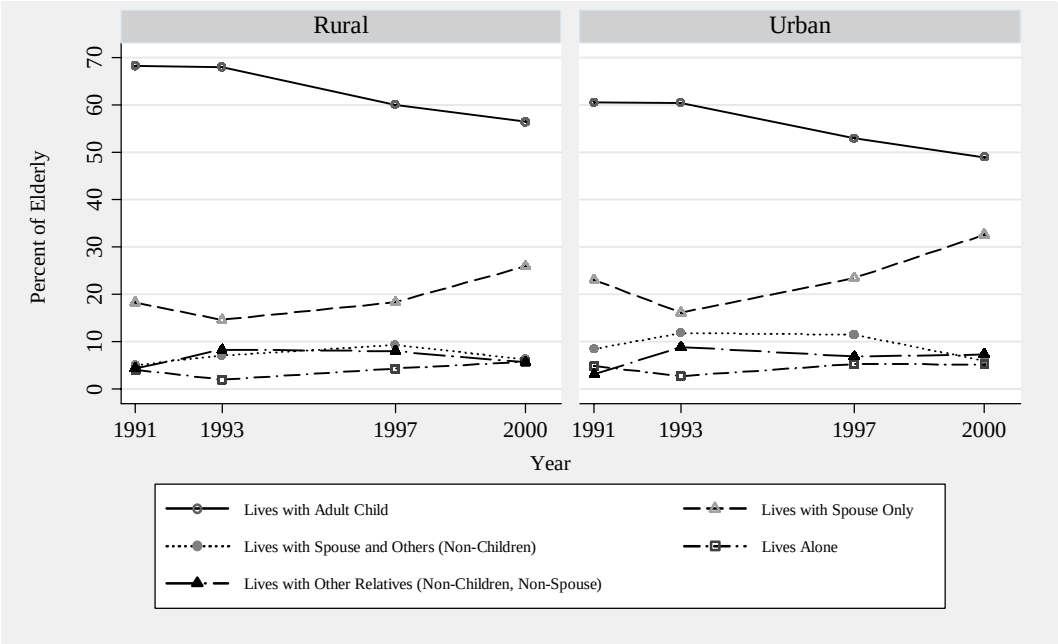
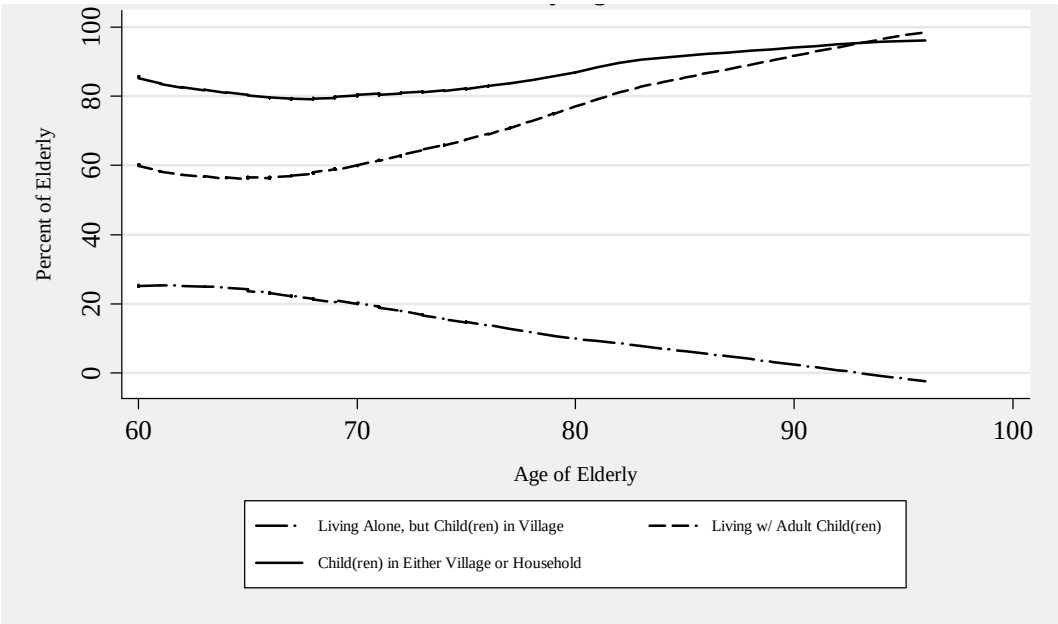


Figure 3. Living Arrangements of China's Elderly (CHNS)



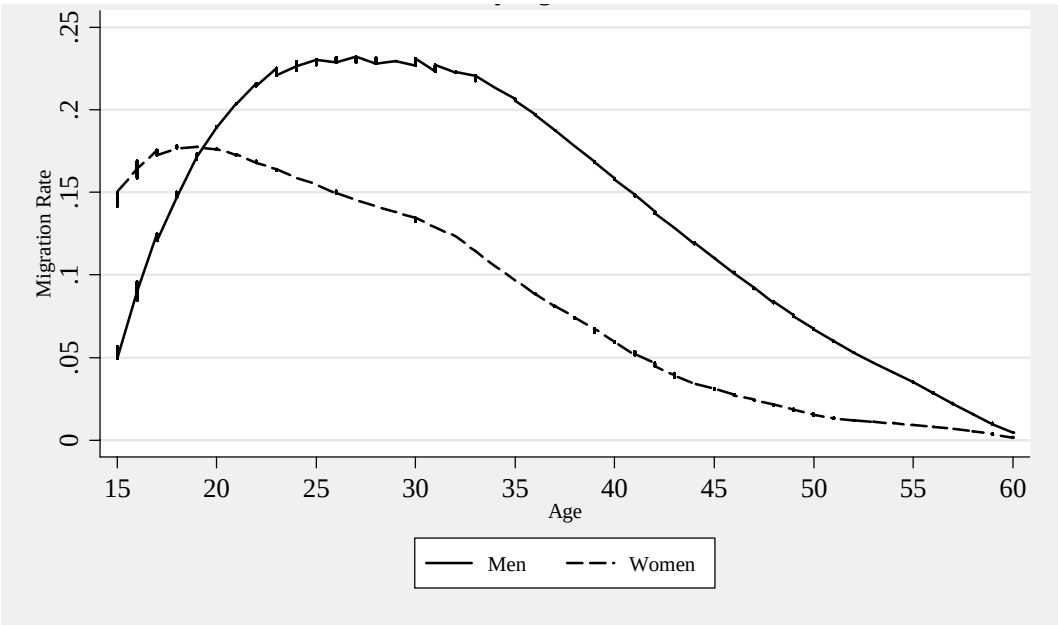
Notes: Information on living arrangements are taken from the 1991, 1993, 1997 and 2000 rounds of the China Health and Nutrition Survey (CHNS).

Figure 4. Living Arrangements of China's Rural Elderly in 2003 (RCRE), By Age



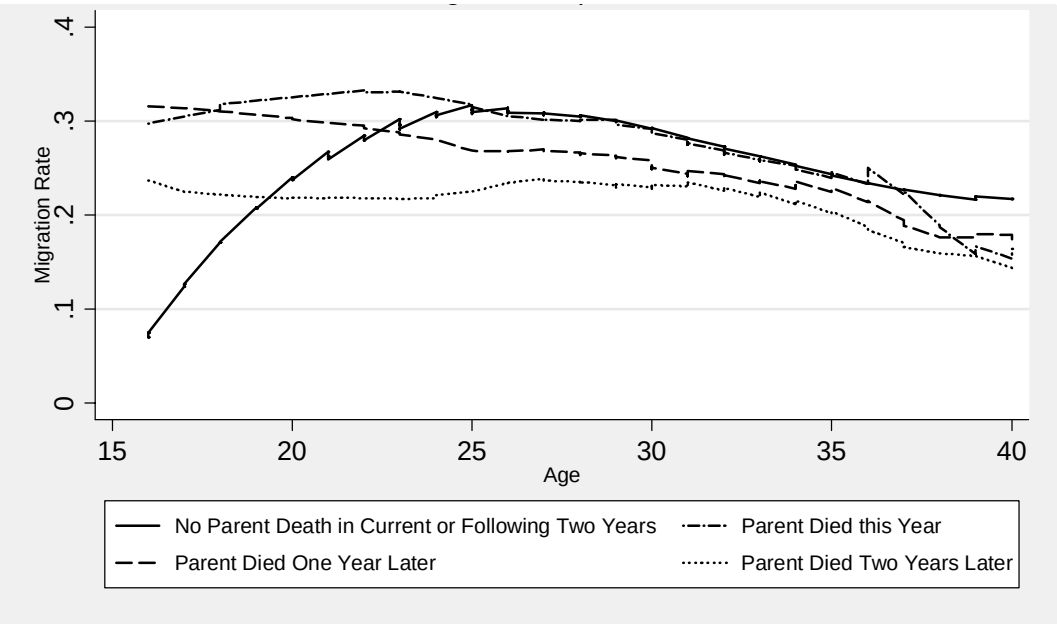
Notes: We show lowess plots (locally weighted non-parametric regression lines) for two groups of elderly: those living alone but with children in the village and those living with children. The solid line shows the lowess plot for elderly who have children either in the household or in the village. In principle, the two dashed lines sum to the solid line, and the omitted category are elderly living alone or with others who do not have children living in the village. Individual data come from the supplemental surveys carried out in collaboration with the authors in RCRE households of Anhui, Henan, Jiangsu and Shanxi provinces in 2004 (RCRE 2004 Supplemental).

Figure 5. Migration Rate from RCRE Villages in 2003, By Age Cohort



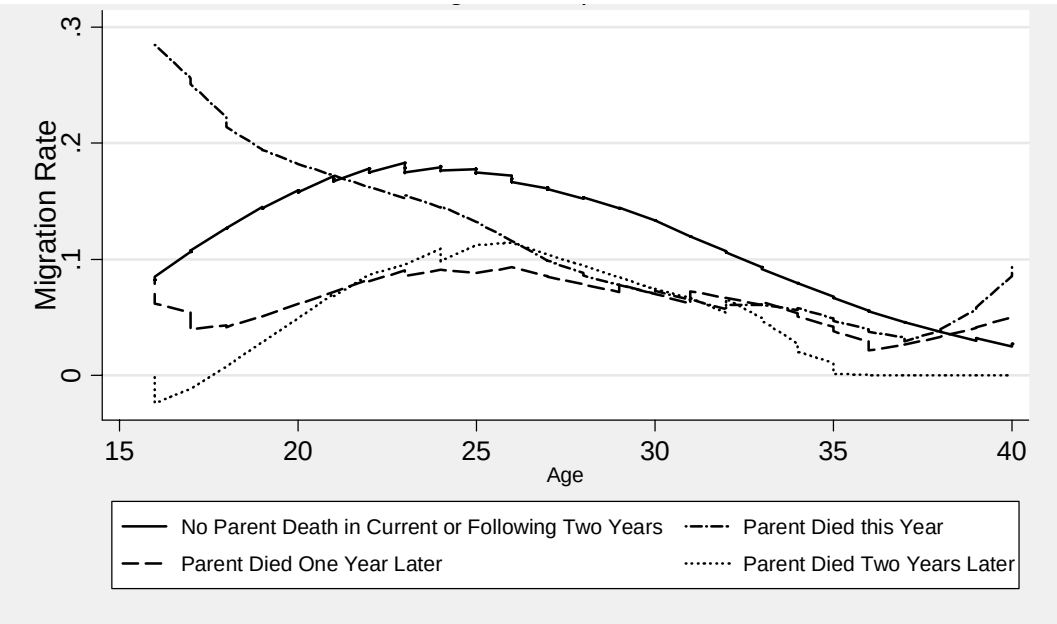
Notes: Data are drawn from the RCRE 2004 Supplemental Survey and reflect the migration status of current and former residents of RCRE households from Anhui, Henan, Jiangsu and Shanxi provinces.

Figure 6. Migration Rate for Men by Timing of Parents' Death: Historical Migration Experience 1994-2002



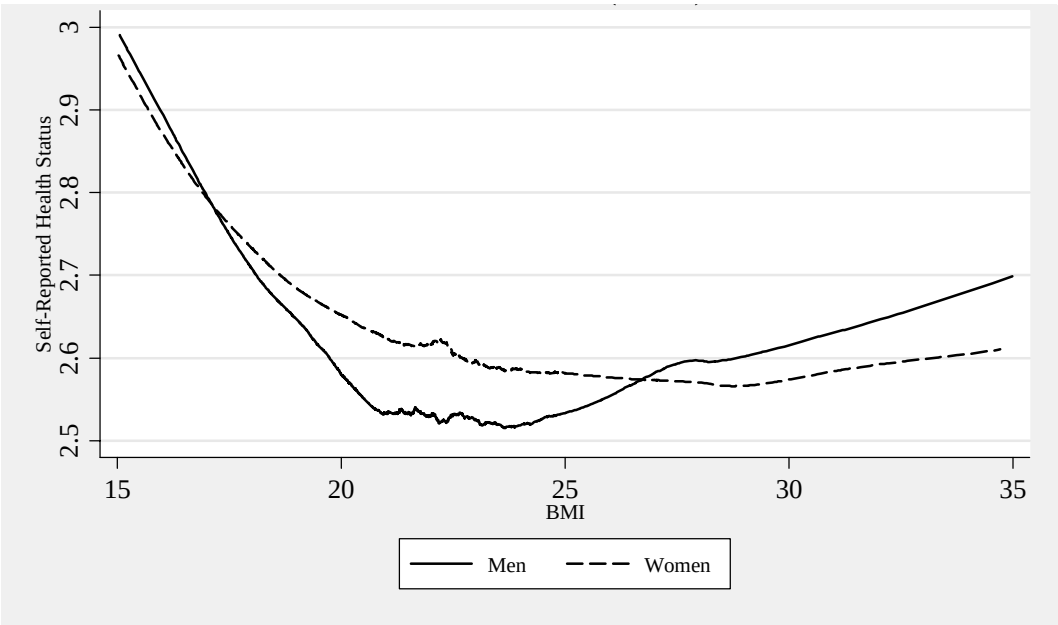
Notes: Migration rates are plotted using *lowess* smoothing. The figure shows migration rates of current and former male residents of RCRE households are broken into groups depending on the timing of parent death. Data are drawn from the RCRE 2004 Supplemental Survey of RCRE households in Anhui, Henan, Jiangsu and Shanxi provinces.

Figure 7. Migration Rate for Women by Timing of Parents' Death: Historical Migration Experience 1994-2002



Notes: Migration rates are plotted using *lowess* smoothing. The figure shows migration rates of current and former female residents of RCRE households are broken into groups depending on the timing of parent death. Data are drawn from the RCRE 2004 Supplemental Survey of RCRE households in Anhui, Henan, Jiangsu and Shanxi provinces.

Figure 8. BMI and the Self-Reported Health Status of the Elderly in Rural China (CHNS)



Notes: Data are drawn from the rural sub-sample of the China Health and Nutrition Survey for survey years 1991, 1993, 1997 and 2000. Lowess plots are shown for individuals over age 60 in the year of observation.

Table 1. Construction of the Analyses Sample from the RCRE Supplemental and Panel Household Surveys, Individuals Aged 16 to 40

		Included	1995	1996	1997	1998	1999	2000	2001	2002
Household Head	Men	Yes	1080	1022	941	787	811	737	740	708
	Women	Yes	50	52	47	38	39	33	30	31
Spouse of Head	Men	Yes	34	33	31	30	26	24	21	23
	Women	Yes	1033	966	884	736	770	707	730	666
Adult Children Living in the Household or Leaving After 1993	Men	Yes	1432	1639	1785	1804	2012	2101	2304	2454
	Women	Yes	926	1101	1233	1243	1426	1532	1686	1807
Adult Children who Left Home Before 1993	Men	No	868	872	861	859	862	849	841	831
	Women	No	1137	1183	1212	1223	1224	1217	1215	1206
Spouse of Adult Children	Men	No	42	51	57	44	58	56	57	61
	Women	No	795	900	950	938	998	979	1042	1049
Other	Men	No	50	51	56	61	66	74	80	97
	Women	No	69	71	76	79	84	91	102	111
Population of Individuals Between 16 and 40 Living in the Household or Connected to the Household By Birth or Marriage	Men	---	3506	3668	3731	3585	3835	3841	4043	4174
	Women	---	4010	4273	4402	4257	4541	4559	4805	4870
Adults Included in Analyses	Men	---	2546	2694	2757	2621	2849	2862	3065	3185
	Women	---	2009	2119	2164	2017	2235	2272	2446	2504

The RCRE Supplemental Household Survey (2004) was conducted in 3999 households located in Anhui, Jiangsu, Henan and Shanxi provinces that were surveyed in the 2003 round of RCRE's Household Panel Survey. The survey includes complete information on the migration experience, education backgrounds, residence locations, and mortality for parents, children and siblings of household head, spouse of household head and adult children of the household who lived in the household after 1993. The survey did not record complete sibling and parent information for non-resident spouses of adult children and other members of the household between 1993 and 2004.

Table 2. The Migrant Employment Decision (RCRE), 1994-2002

Regressors	Men				Women			
	Household Members Only		Non-Resident Parents and Siblings Included		Household Members Only		Non-Resident Parents and Siblings Included	
	1	2	3	4	5	6	7	8
Parent Died in Current Year	-0.049	-0.017	-0.039	-0.161	-0.035	-0.137	-0.060	-0.086
	(0.043)	(0.048)	(0.025)	(0.046)**	(0.071)	(0.086)	(0.031)*	(0.070)
Parent Died in Following Year	-0.066	-0.061	-0.029	-0.137	-0.065	0.002	-0.023	-0.050
	(0.038)*	(0.044)	(0.025)	(0.052)**	(0.065)	(0.126)	(0.033)	(0.075)
Parent Died Two Years Later	-0.080	-0.063	-0.042	-0.115	-0.087	-0.059	0.003	-0.025
	(0.040)**	(0.045)	(0.025)*	(0.052)**	(0.063)	(0.096)	(0.032)	(0.087)
Number of Siblings	0.023	0.024	-0.012	-0.014	0.031	0.030	-0.022	-0.023
	(0.011)**	(0.011)**	(0.004)**	(0.004)**	(0.011)**	(0.011)**	(0.003)**	(0.003)**
Number of Parents Alive (t-1)	-0.052	-0.053	-0.035	-0.034	-0.006	-0.006	-0.028	-0.028
	(0.013)**	(0.013)**	(0.010)**	(0.010)**	(0.016)	(0.016)	(0.008)**	(0.008)**
(Parent Died This Year) * (Number of Siblings)		-0.078		0.029		0.126		0.006
		(0.060)		(0.009)**		(0.100)		(0.010)
(Parent Died in Following Year) * (Number of Siblings)		-0.010		0.025		-0.065		0.006
		(0.050)		(0.010)**		(0.095)		(0.011)
(Parent Died in Two Years Later) * (Number of Siblings))		-0.040		0.018		-0.025		0.005
		(0.060)		(0.010)*		(0.094)		(0.013)
Age	0.064	0.064	0.062	0.062	0.037	0.037	0.035	0.035
	(0.008)**	(0.008)**	(0.008)**	(0.008)**	(0.008)**	(0.008)**	(0.007)**	(0.007)**
Age2	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.0001)**	(0.0001)**	(0.0001)**	(0.0001)**	(0.0001)**	(0.0001)**	(0.0001)**	(0.0001)**
Completed High School (t-1)	0.050	0.050	0.047	0.048	0.022	0.022	0.020	0.020
	(0.022)**	(0.022)**	(0.022)**	(0.022)**	(0.022)	(0.022)	(0.022)	(0.022)
Completed Middle School (t-1)	0.027	0.026	0.025	0.024	0.046	0.046	0.035	0.035
	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)**	(0.016)**	(0.016)**	(0.016)**
Log Consumption per Capita (t-1)	-0.029	-0.029	-0.024	-0.024	0.010	0.010	0.015	0.015
	(0.013)**	(0.013)**	(0.013)*	(0.013)*	(0.013)	(0.013)	(0.013)	(0.013)
Land Per Capita (t-1)	0.003	0.003	-0.002	-0.002	-0.035	-0.035	-0.039	-0.039
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)**	(0.013)**	(0.014)**	(0.014)**

Table 2 Continued on Next Page

Table 2 Continued

	Men				Women			
	Household Members Only		Extended Family		Household Members Only		Extended Family	
	1	2	3	4	5	6	7	8
Number of Chidren Less Than 7 Years Old in HH (t-1)	-0.025	-0.025	-0.012	-0.012	-0.053	-0.053	-0.020	-0.020
	(0.013)*	(0.013)*	(0.013)	(0.013)	(0.011)**	(0.011)**	(0.012)*	(0.012)*
Number of Chidren >=7 and < 16 Years Old in HH (t-1)	-0.036	-0.037	-0.019	-0.019	-0.025	-0.025	0.003	0.003
	(0.009)**	(0.009)**	(0.011)*	(0.011)*	(0.008)**	(0.008)**	(0.009)	(0.009)
Number of Working Age Men in HH (t-1)	-0.085	-0.086	-0.102	-0.102	-0.005	-0.005	-0.016	-0.017
	(0.010)**	(0.010)**	(0.010)**	(0.010)**	(0.010)	(0.010)	(0.010)	(0.010)
Number of Working Age Women (Age 16-60) in HH (t-1)	-0.008	-0.008	0.019	0.020	-0.033	-0.032	-0.016	-0.016
	(0.011)	(0.011)	(0.012)	(0.012)*	(0.011)**	(0.011)**	(0.011)	(0.011)
Number of Elderly Women (Age 60-70) in HH (t-1)	-0.027	-0.027	-0.040	-0.040	-0.022	-0.022	-0.035	-0.036
	(0.019)	(0.019)	(0.023)*	(0.023)*	(0.023)	(0.023)	(0.025)	(0.025)
Number of Elderly Men (Age 60-70) Living in HH (t-1)	-0.019	-0.020	-0.062	-0.061	0.006	0.007	-0.006	-0.006
	(0.015)	(0.015)	(0.022)**	(0.022)**	(0.017)	(0.017)	(0.024)	(0.024)
Number of Elderly Over 70 Living in HH (t-1)	-0.002	-0.002	0.006	0.006	-0.019	-0.019	-0.012	-0.012
	(0.022)	(0.022)	(0.023)	(0.023)	(0.021)	(0.021)	(0.023)	(0.023)
Average Years of Education of Household Residents (t-1)	0.012	0.012	0.013	0.013	0.025	0.025	0.030	0.030
	(0.006)**	(0.006)**	(0.006)**	(0.006)**	(0.006)**	(0.006)**	(0.006)**	(0.006)**
Father's Education: Primary School	0.038	0.038	0.022	0.025	-0.053	-0.053	-0.054	-0.054
	(0.030)	(0.030)	(0.029)	(0.029)	(0.026)**	(0.026)**	(0.027)**	(0.027)**
Father's Education: Lower Middle School or Higher	0.098	0.098	0.054	0.055	-0.053	-0.053	-0.065	-0.065
	(0.053)*	(0.053)*	(0.052)	(0.052)	(0.056)	(0.056)	(0.057)	(0.057)
Mother's Education: Primary School	0.086	0.086	0.098	0.097	0.029	0.030	0.016	0.016
	(0.041)**	(0.041)**	(0.040)**	(0.040)**	(0.039)	(0.039)	(0.040)	(0.040)
Mother's Education: Lower Middle School or Higher	-0.099	-0.099	-0.072	-0.072	0.002	0.002	-0.023	-0.023
	(0.067)	(0.067)	(0.066)	(0.066)	(0.068)	(0.068)	(0.069)	(0.069)
Number of obs	18122	18122	18122	18122	14147	14147	14147	14147
R-squared	0.205	0.205	0.208	0.208	0.157	0.157	0.166	0.166

Notes: The estimation sample includes individuals between 16 and 40 who were household head, spouse of head or adult children who have lived in the household since 1993. The dependent variable is equal to one if the individual is employed outside the home county in year t. Other control variables include village and year dummy variables. The standard errors are robust to heteroskedasticity and serial correlation within a household. Data on migration history of all current and former residents of RCRE households, historical household structure, parent characteristics and timing of parent death comes from the RCRE 2004 Supplemental Survey. These data are merged with historical household consumption per capita and household land per capita information calculated from annual RCRE household surveys 1993 to 2002.

Table 3. Change in Presence of Elderly Resident with Poor or Fair Health: The First-Stage Regression

	Dependent Variable: Δ Elder w/H34	
	Men	Women
Δ Lag Share of Elderly with High BMI	0.099	0.050
	(0.049)**	(0.053)
Δ Lag Share of Elderly with Low BMI	0.117	0.063
	(0.019)**	(0.020)**
Δ Lag Marrital Status (single=1)	-0.004	0.038
	(0.035)	(0.065)
Δ Lag Completed High School	0.028	0.070
	(0.033)	(0.033)**
Δ Lag Completed Middle School	0.003	-0.032
	(0.020)	(0.019)*
Δ Lag Household Average Years of Education	-0.013	-0.009
	(0.006)**	(0.006)
Δ Lag Number of Chidren (Age 0-6)	0.031	0.018
	(0.021)	(0.022)
Δ Lag Number of Children (Age 7-15)	0.022	0.003
	(0.017)	(0.018)
Δ Lag Number of Working Age Men (Age 16-60)	0.028	-0.047
	(0.021)	(0.020)**
Δ Lag Number of Working Age Women (Age 16-60)	0.005	0.021
	(0.017)	(0.017)
Δ Lag Number of Elderly Women (Age 60-70)	0.091	0.016
	(0.043)**	(0.053)
Δ Lag Number of Elderly Men (Age 60-70)	0.127	0.171
	(0.044)**	(0.055)**
Δ Lag Number of Eldest (Age 70 and above)	0.063	0.055
	(0.019)**	(0.024)**
Δ Lag Log Household Income Per Capita	0.002	0.004
	(0.004)	(0.004)
Δ Lag Land Per Capita (Mu)	-0.021	-0.005
	(0.016)	(0.016)
F-statistics for First Stage	20.29	4.92
F-Probability	0.000	0.007
Observations	2733	2443

Notes:

1. Source: China Health and Nutrition Survey (CHNS), 1991, 1993, 1997 and 2000.
2. The dependent variable is change between period t-2 and t-1 in share of elderly household members reporting fair or poor health (share of *H34*).
3. Province*year dummy variables are included and jointly significant in both models.
4. Standard errors are robust to heteroskedasticity and autocorrelation.
5. *Significant at 10 percent level, **Significant at 5 percent level.

Table 4. Elder Parent Health and the Migration Decision of Rural Men and Women (CHNS)

	Men			Women		
	OLS	FD	FDIV	OLS	FD	FDIV
Elderly Member in Fair or Poor Health (H34)? (t-1)	-0.009 (0.015)	-0.021 (0.014)	-0.207 (0.097)**	-0.001 (0.013)	-0.025 (0.016)	-0.031 (0.190)
Marrital Status (single=1) (t-1)	0.022 (0.010)**	-0.033 (0.023)	-0.037 (0.026)	0.048 (0.008)**	-0.047 (0.056)	-0.047 (0.057)
Education (High School) (t-1)	0.020 (0.012)	0.058 (0.024)**	0.065 (0.025)**	0.022 (0.015)	0.017 (0.026)	0.018 (0.028)
Education (Middle School) (t-1)	0.006 (0.009)	0.001 (0.013)	0.001 (0.013)	-0.014 (0.008)	-0.032 (0.013)**	-0.033 (0.015)**
Average Years of Education (t-1)	-0.001 (0.002)	-0.007 (0.004)*	-0.010 (0.004)**	0.002 (0.002)	0.001 (0.004)	0.001 (0.004)
Ln (Household Income Per Capita) (t-1)	-0.003 (0.003)	0.001 (0.003)	0.001 (0.003)	-0.001 (0.002)	-0.002 (0.003)	-0.003 (0.002)
Land Per Capita (Mu/HH Size) (t-1)	-0.009 (0.005)*	-0.023 (0.012)*	-0.026 (0.012)**	-0.011 (0.005)**	-0.024 (0.012)**	-0.024 (0.011)**
Number of Chidren (Age 0-6) (t-1)	-0.012 (0.006)**	0.017 (0.013)	0.023 (0.013)*	-0.008 (0.006)	0.006 (0.015)	0.006 (0.014)
Number of Children (Age 7-15) (t-1)	-0.013 (0.005)**	-0.023 (0.011)**	-0.019 (0.011)	-0.009 (0.005)*	-0.036 (0.014)**	-0.036 (0.012)**
Number of Working Age Men (Age 16-60) (t-1)	0.024 (0.006)**	0.008 (0.015)	0.012 (0.015)	0.019 (0.008)**	0.037 (0.021)*	0.037 (0.019)**
Number of Working Age Women (Age 16-60) (t-1)	0.012 (0.006)**	0.001 (0.015)	0.002 (0.013)	0.020 (0.006)**	-0.001 (0.014)	-0.001 (0.014)
Number of Elderly Women (Age 60-70) (t-1)	0.031 (0.018)*	0.024 (0.032)	0.042 (0.031)	0.046 (0.023)**	0.161 (0.038)**	0.161 (0.034)**
Number of Elderly Men (Age 60-70) (t-1)	0.027 (0.018)	0.037 (0.029)	0.062 (0.030)**	0.006 (0.018)	0.018 (0.032)	0.019 (0.043)
Number of Eldest (Age 70 and above) (t-1)	0.012 (0.009)	0.008 (0.012)	0.020 (0.015)	-0.008 (0.007)	-0.013 (0.012)	-0.013 (0.016)
F-Statistics First Stage (Elderly SRHS) F-Probability			20.29 0.000			4.92 0.007
Over-ID Test: Hansen J-Statistic Chi-Probability			3.696 0.060			0.213 0.645
Number of obs	4448	2733	2733	4110	2443	2443

Notes: The dependent variable is one if an individual in the household in period t-1 lives in another county in period t, the dependent variable equals negative 1 if an individual not residing in the household in t-1 returns in period t, otherwise the dependent variable is zero. FDIV models are estimated using IV-GMM estimation. All models include province-year fixed effects. The standard errors are robust to heteroskedasticy and serial correlation within a household. ** statistically significant at 5% level; * statistically significant at 10% level.

Table 5. First-Stage Regression for Change in Self-Reported Elderly and Own Health Status

	Men		Women	
	Δ Lag Presence of Elderly w/H34	Δ Lag Own H34	Δ Lag Presence of Elderly w/H34	Δ Lag Own H34
Δ Lag Share of Elderly with High BMI	-0.080 (0.048)*	0.079 (0.075)	0.041 (0.068)	-0.054 (0.055)
Δ Lag Share of Elderly with Low BMI	0.002 (0.026)	0.133 (0.026)**	0.078 (0.026)**	-0.034 (0.029)
Δ Lag Self Reported Morbidity	0.146 (0.059)**	0.111 (0.069)	-0.087 (0.055)	0.364 (0.082)**
Δ Lag (Difference from Household Average BMI)/(Household Average BMI)	0.082 (0.031)**	0.066 (0.035)*	0.051 (0.036)	0.051 (0.033)
F-statistics for Test of Excluded Instruments	8.64	3.36	3.26	5.97
F-Probability	0.000	0.010	0.011	0.000
Observations	2275	2275	2443	2443

Note: 1. Other variables in the first-stage regressions include change of lag marital status, change of lag education level, change of lag household average years of schooling, change in lag number of children, change in lag number of working age men, women, change in the lag number of elderly, change in lag household income per capita, and province-year dummy variables. 3. The standard errors are robust to heteroskedasticity and autocorrelation. 4. * significant at 10% level, ** significant at 5% level.

Table 6. Elder Parent Health and the Migration Decision, Conditional on Own Health

	Men			Women		
	OLS	FD	FDIV	OLS	FD	FDIV
Elderly Member in Fair or Poor Health (H34)? (t-1)	-0.011 (0.015)	-0.021 (0.015)	-0.244 (0.102)**	-0.006 (0.014)	-0.023 (0.016)	-0.130 (0.183)
Own Health Fair or Poor (H34) (t-1)	0.005 (0.012)	-0.002 (0.015)	0.304 (0.193)	0.011 (0.011)	-0.004 (0.014)	-0.050 (0.074)
High BMI (t-1)	0.008 (0.013)	0.013 (0.018)	0.008 (0.019)	-0.001 (0.008)	-0.006 (0.016)	-0.011 (0.018)
Low BMI (t-1)	-0.024 (0.015)	0.008 (0.017)	0.014 (0.020)	-0.031 (0.015)**	-0.001 (0.017)	-0.003 (0.018)
Marrital Status (single=1) (t-1)	0.026 (0.011)**	-0.033 (0.023)	-0.022 (0.027)	0.052 (0.008)**	-0.047 (0.057)	-0.047 (0.060)
Completed High School (t-1)	0.018 (0.012)	0.057 (0.024)**	0.083 (0.028)**	0.021 (0.015)	0.017 (0.026)	0.026 (0.030)
Completed Middle School (t-1)	0.005 (0.009)	0.002 (0.014)	0.014 (0.016)	-0.015 (0.009)*	-0.033 (0.013)**	-0.039 (0.018)**
Average Years of Education (t-1)	0.001 (0.002)	-0.007 (0.004)*	-0.010 (0.005)**	0.002 (0.002)	0.001 (0.004)	0.0005 (0.004)
Ln(Household Income Per Capita) (t-1)	-0.003 (0.003)	0.001 (0.003)	0.001 (0.003)	-0.001 (0.002)	0.001 (0.003)	0.002 (0.003)
Land Per Capita (t-1)	-0.009 (0.005)*	-0.023 (0.012)**	-0.021 (0.014)	-0.011 (0.006)**	-0.024 (0.011)**	-0.026 (0.012)**
Number of Chidren (Age 0-6) (t-1)	-0.012 (0.006)**	0.017 (0.013)	0.022 (0.015)	-0.007 (0.006)	0.006 (0.015)	0.009 (0.016)
Number of Children (Age 7-15) (t-1)	-0.012 (0.005)**	-0.024 (0.011)**	-0.023 (0.013)*	-0.008 (0.005)	-0.035 (0.014)**	-0.034 (0.014)**
Number of Working Age Men (Age 16-60) (t-1)	0.023 (0.006)**	0.008 (0.015)	0.006 (0.017)	0.019 (0.008)**	0.037 (0.021)*	0.030 (0.023)
Number of Working Age Women (Age 16-60) (t-1)	0.012 (0.006)**	0.001 (0.015)	0.003 (0.017)	0.018 (0.006)**	0.003 (0.014)	0.003 (0.015)
Number of Elderly Women (Age 60-70) (t 1)	0.030 (0.018)*	0.023 (0.032)	0.044 (0.036)	0.047 (0.023)**	0.161 (0.038)**	0.161 (0.038)**
Number of Elderly Men (Age 60-70) (t-1)	0.028 (0.018)	0.037 (0.029)	0.060 (0.036)*	0.008 (0.018)	0.018 (0.032)	0.037 (0.043)
Number of Eldest (Age 70 and above) (t-1)	0.012 (0.009)	0.008 (0.012)	0.020 (0.015)	-0.007 (0.007)	-0.013 (0.012)	-0.008 (0.016)
F-Statistic (Own SRHS) F-Probability			3.36 0.010			5.97 0.000
F-Statistics (Old Member SRHS) F-Probability			8.64 0.000			3.26 0.011
Over-ID Test: Hansen J-Statistic Chi-Probability			0.991 0.609			1.539 0.463
Number of obs	4448	2733	2275	4110	2443	2443

Notes: The dependent variable is one if an individual in the household in period t-1 lives in another county in period t, the dependent variable equals negative 1 if an individual not residing in the household in t-1 returns in period t, otherwise the dependent variable is zero. FDIV models are estimated using IV-GMM estimation. All models include province-year fixed effects. The standard errors are robust to heteroskedasticy and serial correlation within a household. ** statistically significant at 5% level; * statistically significant at 10% level.

Table A.1. Summary Statistics for RCRE 1994-2002 Analyses, Analysis Sample

	All	1995	1996	1997	1998	1999	2000	2001	2002
Panel A									
Individual Characteristics (Men Age 16 to 40)									
Age	26.745	26.741	26.547	26.392	26.333	26.598	26.715	27.118	27.363
	(7.034)	(7.430)	(7.261)	(7.087)	(6.926)	(6.884)	(6.856)	(6.872)	(6.946)
Participates in Migrant Labor Market	0.303	0.193	0.211	0.230	0.276	0.298	0.350	0.393	0.430
	(0.460)	(0.395)	(0.408)	(0.421)	(0.447)	(0.457)	(0.477)	(0.489)	(0.495)
First-Time Participant in Migrant Labor Market	0.046	0.040	0.028	0.032	0.053	0.046	0.063	0.053	0.052
	(0.210)	(0.195)	(0.165)	(0.175)	(0.223)	(0.210)	(0.243)	(0.224)	(0.222)
Number of Parents Alive	0.900	1.022	0.993	0.959	0.909	0.892	0.851	0.815	0.797
	(0.819)	(0.823)	(0.827)	(0.825)	(0.818)	(0.811)	(0.813)	(0.808)	(0.802)
Lower Middle School	0.701	0.648	0.671	0.690	0.695	0.712	0.714	0.725	0.734
	(0.458)	(0.478)	(0.470)	(0.463)	(0.461)	(0.453)	(0.452)	(0.446)	(0.442)
High School or More	0.160	0.136	0.145	0.154	0.151	0.164	0.170	0.174	0.181
	(0.367)	(0.343)	(0.352)	(0.361)	(0.358)	(0.370)	(0.376)	(0.379)	(0.385)
Number of Siblings	2.687	3.308	3.084	2.883	2.779	2.601	2.462	2.337	2.224
	(2.162)	(2.337)	(2.281)	(2.241)	(2.154)	(2.106)	(2.055)	(1.997)	(1.939)
Parent Died This Year	0.014	0.012	0.018	0.017	0.018	0.015	0.016	0.010	0.008
	(0.117)	(0.110)	(0.132)	(0.128)	(0.133)	(0.121)	(0.126)	(0.100)	(0.088)
Parent Died Next Year	0.015	0.020	0.017	0.020	0.014	0.017	0.012	0.008	0.009
	(0.120)	(0.140)	(0.130)	(0.140)	(0.118)	(0.130)	(0.110)	(0.092)	(0.097)
Parent Died Two Years Later	0.014	0.019	0.025	0.015	0.017	0.013	0.009	0.011	0.004
	(0.116)	(0.136)	(0.157)	(0.121)	(0.128)	(0.115)	(0.093)	(0.103)	(0.061)
Father's Education: Primary School	0.113	0.146	0.131	0.125	0.099	0.110	0.108	0.098	0.093
	(0.316)	(0.353)	(0.337)	(0.331)	(0.298)	(0.313)	(0.310)	(0.297)	(0.290)
Father's Education: Middle School or Higher	0.044	0.032	0.035	0.039	0.041	0.047	0.050	0.052	0.054
	(0.206)	(0.176)	(0.184)	(0.194)	(0.199)	(0.212)	(0.219)	(0.221)	(0.225)
Mother's Education: Primary School	0.047	0.046	0.045	0.046	0.039	0.049	0.050	0.049	0.051
	(0.211)	(0.209)	(0.208)	(0.209)	(0.193)	(0.215)	(0.218)	(0.216)	(0.219)
Mother's Education: Middle School or Higher	0.021	0.012	0.014	0.017	0.019	0.022	0.025	0.026	0.027
	(0.142)	(0.108)	(0.118)	(0.128)	(0.135)	(0.147)	(0.157)	(0.159)	(0.161)
Number of Individuals	22579	2546	2694	2757	2621	2849	2862	3065	3185

Table A.1 Continued on Next Page

Table A.1 Continued

	All	1995	1996	1997	1998	1999	2000	2001	2002
Panel B:									
Individual Characteristics (Women Age 16 to 40)									
Age	26.702	27.209	26.827	26.451	26.168	26.471	26.492	26.960	26.984
	(7.253)	(7.683)	(7.515)	(7.342)	(7.136)	(7.094)	(7.082)	(7.142)	(7.048)
Migration	0.167	0.071	0.094	0.116	0.143	0.172	0.204	0.231	0.269
	(0.373)	(0.256)	(0.292)	(0.321)	(0.350)	(0.377)	(0.403)	(0.422)	(0.443)
First-Time Participant in Migrant Labor Market	0.031	0.014	0.022	0.023	0.032	0.034	0.036	0.038	0.041
	(0.172)	(0.117)	(0.146)	(0.149)	(0.177)	(0.181)	(0.187)	(0.192)	(0.198)
Number of Parents Alive	0.959	1.066	1.045	1.020	0.963	0.953	0.912	0.886	0.863
	(0.809)	(0.819)	(0.818)	(0.812)	(0.808)	(0.805)	(0.802)	(0.796)	(0.796)
Lower Middle School	0.571	0.491	0.521	0.551	0.561	0.589	0.603	0.607	0.620
	(0.495)	(0.500)	(0.500)	(0.498)	(0.496)	(0.492)	(0.489)	(0.488)	(0.485)
Higher School or More	0.146	0.137	0.133	0.137	0.137	0.145	0.152	0.157	0.161
	(0.353)	(0.344)	(0.340)	(0.344)	(0.343)	(0.352)	(0.360)	(0.364)	(0.368)
Number of Siblings	3.208	4.039	3.731	3.469	3.341	3.092	2.914	2.760	2.572
	(2.316)	(2.368)	(2.357)	(2.325)	(2.286)	(2.269)	(2.218)	(2.206)	(2.150)
Parent Died This Year	0.005	0.005	0.005	0.005	0.007	0.005	0.006	0.005	0.004
	(0.072)	(0.074)	(0.072)	(0.068)	(0.086)	(0.070)	(0.075)	(0.073)	(0.060)
Parent Died Next Year	0.005	0.007	0.004	0.007	0.005	0.006	0.007	0.003	0.004
	(0.073)	(0.086)	(0.065)	(0.083)	(0.070)	(0.076)	(0.081)	(0.057)	(0.066)
Parent Died Two Years Later	0.005	0.005	0.007	0.006	0.006	0.006	0.003	0.005	0.000
	(0.069)	(0.070)	(0.081)	(0.080)	(0.080)	(0.079)	(0.055)	(0.073)	(0.020)
Father's Education: Primary School	0.118	0.160	0.138	0.129	0.099	0.114	0.112	0.103	0.097
	(0.322)	(0.367)	(0.345)	(0.335)	(0.298)	(0.317)	(0.315)	(0.304)	(0.296)
Father's Education: Middle School or Higher	0.039	0.026	0.028	0.033	0.034	0.043	0.047	0.047	0.050
	(0.194)	(0.159)	(0.165)	(0.178)	(0.181)	(0.204)	(0.211)	(0.212)	(0.219)
Mother's Education: Primary School	0.052	0.050	0.049	0.050	0.041	0.054	0.056	0.057	0.055
	(0.221)	(0.218)	(0.215)	(0.218)	(0.199)	(0.225)	(0.231)	(0.232)	(0.228)
Mother's Education: Middle School or Higher	0.024	0.015	0.017	0.021	0.021	0.026	0.028	0.029	0.031
	(0.153)	(0.121)	(0.129)	(0.143)	(0.143)	(0.160)	(0.165)	(0.167)	(0.174)
Number of Individuals	17766	2009	2119	2164	2017	2235	2272	2446	2504

Table A.1 Continued on Next Page

Table A.1 Continued

	All	1995	1996	1997	1998	1999	2000	2001	2002
Panel C:									
Household Charateristics									
Number of Eldest (Age 70 and above)	0.072	0.043	0.052	0.058	0.067	0.075	0.081	0.090	0.100
	(0.293)	(0.230)	(0.249)	(0.262)	(0.282)	(0.302)	(0.304)	(0.329)	(0.348)
Number of Elderly Men (Age 60-70)	0.088	0.064	0.068	0.073	0.088	0.088	0.099	0.107	0.115
	(0.284)	(0.245)	(0.251)	(0.260)	(0.284)	(0.284)	(0.299)	(0.309)	(0.319)
Number of Elderly Women (Age 60-70)	0.082	0.076	0.077	0.074	0.080	0.074	0.081	0.092	0.098
	(0.275)	(0.266)	(0.268)	(0.264)	(0.273)	(0.263)	(0.274)	(0.290)	(0.298)
Number of Working Age Women (Age 16-60)	0.875	0.863	0.858	0.862	0.863	0.866	0.887	0.888	0.906
	(0.641)	(0.602)	(0.607)	(0.627)	(0.633)	(0.643)	(0.664)	(0.672)	(0.669)
Number of Working Age Men (Age 16-60)	1.062	1.144	1.115	1.109	1.082	1.055	1.040	0.993	0.976
	(0.712)	(0.697)	(0.704)	(0.712)	(0.711)	(0.710)	(0.724)	(0.713)	(0.705)
Number of Children (Age 7-15)	0.504	0.636	0.592	0.543	0.524	0.489	0.456	0.422	0.396
	(0.861)	(0.947)	(0.934)	(0.909)	(0.905)	(0.861)	(0.802)	(0.773)	(0.735)
Number of Chidren (Age 0-6)	0.174	0.248	0.203	0.179	0.165	0.157	0.149	0.150	0.150
	(0.434)	(0.515)	(0.471)	(0.443)	(0.439)	(0.421)	(0.394)	(0.391)	(0.386)
Average Years of Education of Household Members	6.853	6.849	6.877	6.881	6.807	6.853	6.866	6.841	6.847
	(1.699)	(1.702)	(1.704)	(1.709)	(1.689)	(1.699)	(1.692)	(1.697)	(1.700)
Consumption per Capita (1986 RMB Yuan)	538.506	548.493	535.531	526.537	511.473	528.239	532.428	540.885	579.563
	(307.920)	(290.081)	(294.287)	(271.548)	(278.893)	(304.168)	(306.744)	(323.450)	(368.750)
Land per Capita (Mu/Capita)	1.269	1.300	1.309	1.296	1.233	1.273	1.252	1.251	1.244
	(0.967)	(0.904)	(0.959)	(0.949)	(0.923)	(0.962)	(0.973)	(1.003)	(1.042)
Number of Households	28314	3496	3507	3526	3537	3547	3565	3569	3567

Table A.2. Summary Statistics for CHNS Analysis Sample

	All	1991	1993	1997	2000
Panel A: Individual Charateristics (Men 16-40 Years of Age)					
Age	26.99	27.16	26.72	26.94	27.18
	(7.17)	(7.61)	(7.30)	(6.81)	(6.95)
Migrated from Household Between t-1 and t	0.07		0.06	0.10	0.11
	(0.25)		(0.25)	(0.30)	(0.31)
Middle School Graduate	0.66	0.64	0.62	0.67	0.71
	(0.47)	(0.48)	(0.48)	(0.47)	(0.45)
High School Graudate or Higher	0.18	0.16	0.16	0.21	0.22
	(0.39)	(0.37)	(0.36)	(0.40)	(0.41)
Single	0.52	0.42	0.51	0.56	0.58
	(0.50)	(0.49)	(0.50)	(0.50)	(0.49)
Fair or Poor Health (H34=1)	0.01	0.01	0.01	0.01	0.01
	(0.11)	(0.12)	(0.11)	(0.09)	(0.11)
High BMI	0.15	0.15	0.16	0.12	0.16
	(0.35)	(0.36)	(0.36)	(0.32)	(0.36)
Low BMI	0.04	0.02	0.02	0.05	0.08
	(0.20)	(0.15)	(0.15)	(0.22)	(0.27)
Number of Individuals	6631	1577	1732	1757	1565
Panel B: Individual Charateristics (Women 16-40 Years of Age)					
Age	27.01	27.15	26.75	26.96	27.22
	(7.10)	(7.51)	(7.18)	(6.73)	(6.95)
Migrated from Household Between t-1 and t	0.06		0.05	0.07	0.10
	(0.23)		(0.22)	(0.26)	(0.30)
Middle School Graduate	0.49	0.45	0.45	0.52	0.56
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
High School Graudate or Higher	0.12	0.10	0.10	0.14	0.16
	(0.33)	(0.30)	(0.30)	(0.35)	(0.37)
Single	0.48	0.38	0.48	0.53	0.54
	(0.50)	(0.48)	(0.50)	(0.50)	(0.50)
Fair or Poor Health (H34=1)	0.02	0.02	0.02	0.02	0.03
	(0.13)	(0.13)	(0.13)	(0.12)	(0.16)
High BMI	0.19	0.23	0.21	0.14	0.16
	(0.40)	(0.42)	(0.41)	(0.35)	(0.37)
Low BMI	0.04	0.02	0.03	0.03	0.08
	(0.19)	(0.15)	(0.17)	(0.18)	(0.27)
Number of Individuals	6142	1526	1668	1697	1251

Table A.2 Continued on Following Page

Table A.2 Continued

	All	1991	1993	1997	2000
Panel C: Household Demographic Structure					
Number of Eldest (Age 70 and above)	0.20	0.11	0.15	0.28	0.26
	(0.56)	(0.34)	(0.41)	(0.74)	(0.65)
Number of Elderly Men (Age 60-70)	0.12	0.09	0.11	0.15	0.14
	(0.33)	(0.29)	(0.31)	(0.36)	(0.35)
Number of Elderly Women (Age 60-70)	0.12	0.08	0.12	0.15	0.15
	(0.33)	(0.28)	(0.32)	(0.36)	(0.35)
Number of Working Age Women (Age 16-60)	1.54	1.39	1.56	1.63	1.59
	(0.89)	(0.77)	(0.92)	(0.96)	(0.91)
Number of Working Age Men (Age 16-60)	1.55	1.41	1.54	1.61	1.64
	(0.81)	(0.75)	(0.84)	(0.85)	(0.80)
Number of Children (Age 7-15)	0.86	0.92	0.94	0.84	0.71
	(0.94)	(0.93)	(0.97)	(0.97)	(0.86)
Number of Chidren (Age 0-6)	0.37	0.64	0.43	0.20	0.20
	(0.65)	(0.81)	(0.67)	(0.47)	(0.47)
Household Members Average Years of Schooling	5.63	5.15	5.11	5.96	6.48
	(2.20)	(2.09)	(2.01)	(2.14)	(2.28)
Income Per Capita (1986 RMB Yuan)	663.83	414.81	576.98	717.56	1005.49
	(1678.89)	(626.83)	(1408.94)	(1445.49)	(2715.77)
Land Per Capita (Mu/Capita)	0.83	0.86	0.88	0.78	0.78
	(0.99)	(0.66)	(1.17)	(0.97)	(1.11)
Panel D: Health Status of Household Members					
Households With Elderly an Member in Fair or Poor Health (*H34=1*)	0.13	0.11	0.10	0.14	0.18
	(0.34)	(0.31)	(0.30)	(0.35)	(0.38)
Share of Elderly with High BMI	0.04	0.03	0.03	0.06	0.05
	(0.19)	(0.16)	(0.15)	(0.25)	(0.19)
Share of Elderly with Low BMI	0.04	0.02	0.01	0.09	0.04
	(0.26)	(0.15)	(0.11)	(0.44)	(0.17)
Standardized Difference Between Min and Max BMI in Household	0.43	0.40	0.41	0.43	0.46
	(0.23)	(0.23)	(0.21)	(0.25)	(0.21)
Number of Households	6459	1636	1682	1665	1476